TOXICOLOGIA,

OR

A TREATISE ON

INTERNAL POISONS,

IN THEIR RELATION TO

MEDICAL JURISPRUDENCE, PHYSIOLOGY,

AND THE

PRACTICE OF PHYSIC.

BY W. F. LOWRIE, M. D.

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NOTICES OF THE WORK.

The following are a few of the Notices the Author has received for his work, from professional gentlemen of the first talent in the United States.

BOSTON, Aug. 2, 1831.

I have examined with attention the proposed work of Dr. Lowrie on Toxicology, and should, on account of the simplicity of its arrangement, as well as its general excellence, recommend it as an useful and convenient compend on this subject. The introductory remarks of the author are very judicious, and necessary to medical men, who, during legal investigations, are so often betrayed into inaccuracies from the want of a methodical course, such as these remarks so well elucidate. The rationale of the practice evinces an intimate and practical acquaintance with the subject.

WINSLOW LEWIS, Jr. M. D.

BOSTON, July 18, 1831.

I have examined Dr. W. F. Lowrie's MS. work on Toxicology, and feel authorised to state my belief, that the general plan and arrangement is excellent, and if executed with fidelity, (as it appears to be,) it will be a useful acquisition to the medical profession.

JAMES BIGELOW,
Prof. of Mat. Med., Harvard University.

CAMBRIDGE, July 19. 1831.

Dr. Lowrie having exhibited to me portions of his proposed work, I fully concur with Dr. Bigelow in the opinion expressed above.

J. WEBSTER,
Erving Prof. of Chemistry in Harvard University.

Boston, July 26, 1831.

To ——— Lowrie, Esq.

Sir—

I have examined portions of your manuscript, and agree with my colleagues, Professors Eigelow and Webster, in the opinion they have given of its plan. I beg leave to add, that in the execution of your plan, much industry is displayed in the search for, and use of the best materials, in the compilation of the work, and that I cannot but think it will be very useful for those for whom it is designed. Yours,

WALTER CHANNING,

Prof. Midwifery and Medical Jurisprudence in Harvard University.

New-York, June 2, 1831.
25 *Park Place.*

From the examination which I have given of Wm. F. Lowrie's work on Toxicology, I am of the opinion, that it will be a very useful manual to the practitioner of medicine as well as the student. I hope he will receive sufficient encouragement to lay the result of his researches before the public.

VALENTINE MOTT.

New-York, Nov. 23, 1831.

Dr. Lowrie.

I have given your MS. work on Toxicology a perusal, and have no hesitation in saying, that its publication will prove serviceable. From amid the mass of well established facts with which this science has been recently enriched, you have made a selection, a more extended knowledge of which must prove eminently useful. Most respectfully,

JOHN W. FRANCIS, M. D.

Formerly Prof. of Obstetrics and Forensic Medicine.

Columbia College, New-York, 27th May, 1831.

I have examined with much pleasure the plan of a work on Toxicology, by Mr. W. F. Lowrie. Into the detail of its parts I have not had time to enter, but feel satisfied, that if it be executed with the same intelligence that has directed the formation of the plan, this treatise cannot fail of being useful to the practical chemist, and medical practitioner.

JAMES RENWICK, L. L. D.

Prof. of Nat. and Exp. Philosophy and Chemistry.

Hartford, June 13, 1831.

The work of Mr. Lowrie, on Toxicology, appears to me to be calculated in its *general arrangement*, to facilitate the labours of students in acquiring a knowledge of the action of poisons on the animal economy, and of the means of counteracting their deleterous operation. Of the *details* of his plan, I have been enabled to take but a cursory view: the examination, however, which I *have* given it, leads me to believe that it may prove a valuable acquisition to the medical profession; and I sincerely hope the author may meet with the encouragement and support, which are due to his efforts to throw light on a subject of so much importance.

J. SMYTH ROGERS, M. D.

Prof. of Chemistry in Washington College, Hartford, Conn. and of Mat. Med. and Pharmacy in the New-York College of Pharmacy.

PREFACE.

The importance of a correct knowledge of Toxicology, must be sufficiently obvious to every person, who is an observer of the common occurrences of life. To the philanthropist, the knowledge of the great extent of human misery occasioned by the improper use of poisons, must be extremely distressing; and cases of murder, suicide and accidental death, by poisoning, have become so numerous, that we can scarcely peruse a newspaper, without finding that their number is almost daily augmenting. But, whilst he is under the painful necessity of viewing the misery occasioned by the evil, he will derive the highest gratification from a knowledge, that it may be considerably lessened; and he will hail with sincere pleasure, and aid by his most powerful efforts, the progress of science, in not only partially removing, but, if possible, in every case entirely destroying it. To the medical practitioner, a correct and extensive knowledge of Toxicology is highly important and absolutely necessary. To him, in cases of poisoning, is committed the life of the patient, together with the happiness and welfare of his family; which may all be sacrificed by a want of knowledge, presence of mind, or promptness of decision. But, as a medical jurist, his responsibility is very considerably increased. In this capacity, (and what medical practitioner knows when he may be called upon to fill it?) the life and character of the supposed criminal are more or less dependant upon him; and he has, by strict scrutiny into the facts before him, together with a correct and extensive knowledge of the various branches of Toxicological science, and deliberate consideration, to form his decision of the case. He has not only to satisfy himself, as to the correctness of his opinion, but also the court, the faculty, and, as much as possible, the world at large, as his decision may materially influence the opinion of other medical jurists

on similar cases, at subsequent periods ; and he can only be fitted to perform aright these responsible duties, by intense study, elaborate research, and actual experiments.

The advantages of Toxological science are fourfold. First, it enables the physician to prescribe antidotes for any case of poisoning that may come within the sphere of his practice. Thus, to Toxicology he owes the knowledge of albumen as an antidote to oxymuriate of Mercury and verdigris ; of bark against tartrite of antimony ; of the alkaline sulphates against the acetate of lead ; of the earthy and alkaline chlorides for sulphuret of potass ; of ammonia and chlorine for hydrocyanic acid, &c.

Secondly, it furnishes the physiologist with valuable instruments of research, in his investigations into the laws of animal economy, as in the doctrine of absorption.

Thirdly, it aids the physician in his enquries, when examining the action of many of the most powerful articles of the materia medica : as, from a knowledge of their action, when taken as a poison, he draws inferences as to their action when given as remedies. Hence the beneficial effects of opium and acetas plumbi, in cases of dysentry, may be accounted for by the sedative effects of the one, in a spasmodic affection of the bowels, and the paralytic property of the other. The peculiar action of cantharides in stimulating the bladder to excess, when taken as a poison, accounts for its beneficial effects when employed as a therapeutic agent. We are also frequently indebted to Toxicology for the discovery of direct remedies for diseases, acquired from a knowledge of their action as poisons. All the energetic articles in the materia medica are poisonous in large doses, and it is indispensibly necessary to be well acquainted with their deleterious effects, before they can be employed with certainty or security as remedies. This knowledge is particularly called for in regard to those remedies, (probably not a few in number,) whose therapeutic effects are not developed, until their physiological effects have made their appearance.

Fourthly, it enables him to collect from numerous branches of the medical science, and also from collateral sciences, the materi-

als of the most important department, medical jurisprudence; and although it admits of being applied to many other departments of the medical science, yet its power, extent and value are most evident in this.

The medical jurist derives his resources from semeiology, pathology, chemistry, and physiology. By the first, he ascertains the difference between the symptoms of poisoning, and natural disease; by the second, he discriminates the morbid appearances indicative of death by poison, from those produced by natural death; the third enables him to discover foreign substances of a deleterious nature, in the body and elsewhere; and by the fourth, he determines the value of evidence from accidental, or express experiments, upon the lower animals.

The study of this science, in its relations to chemistry and physiology, has expelled from the practice of medicine the use of many popular remedies, the offspring of empiricism, which instead of being beneficial, were injurious. In short, Toxicology ranges over the whole vast field of medical learning, and draws together, from a variety of quarters, facts and principles which are seldom found at any other time in combination. The resources of each branch of this science are made by the Toxologist to try the accuracy and supply the defects of the others; and the whole mass of knowledge is brought to bear in one direction, with a force and precision worthy of its objects—the amelioration of human misery—the detection of crime—and the vindication of innocence.

Considering the objects of, and the importance attached to this branch of the medical science, it is a matter of surprise that so little should have been written in the English language on this subject. The works which have been published in this language within the present century, are, a partial translation of Orfila; that part of Dr. Paris' Pharmacologia employed exclusively on the consideration of poisons; and a Treatise on Poisons by Prof. Christison, of Edinburgh.* Hence, the medical student and practitioner have

* John Johnstone, M. B. published an Essay on Mineral Poisons in Eversham, England, 1795. Note by Prof. Channing of Harvard University.

had, not only to devote a very considerable portion of their time to the examination of a number of voluminous works; but to study other languages, in order to be able to acquire a sufficient knowledge of this science, to practice with safety to their patients, and credit to themselves. In order, if possible, to obviate this difficulty, and to present to the student and physician a compendium of Toxicological knowledge, the author has compiled the present treatise ; which he hopes will be found valuable, not only as a work of reference in cases of emergency, but also as conveying to the medical jurist necessary information in cases of doubt and difficulty. To what extent he has succeeded, he must leave to the candour of his readers to determine. The plan of the work is new in its arrangement, and will, it is hoped, be found advantageous, in not only enabling the practitioner to refer to any separate subject or poison immediately, but also in facilitating an acquirement of the knowledge of this science. It is divided into two parts. The first being devoted to general poisoning, its evidences, modifying causes, &c. will be found especially useful to the medical jurist. The second, on particular poisons, will be the most useful to the medical student and practitioner: and in both parts, the abbreviated style of writing is adopted, which will admit of a greater quantity of matter being placed in the same compass than could otherwise be done. Throughout the whole the greatest care has been taken to exclude, as much as possible, any form either for use, remedies, or tests, which is of doubtful utility, and not well recommended by the best writers. It will be sufficiently obvious, that the size of the doses prescribed, both for use and as remedies, are medium doses, and must be prescribed, not according to any given rule, but modified as may be necessary under the existing circumstances of the case.

In treating of the medical use of the several poisons, the well established properties of each article are given; but in cases in which any article has been recently applied as a remedy in any disease, on the supposition of its possessing properties not yet well ascertained, (as in the recent application of the fumes of nitric acid in tubercular consumption,) it is noticed as such only.

In treating of the remedies, it will be seen, that those are prescribed which will be found the most efficacious; and in the selection of them the practitioner will, of course, be directed by the contingent circumstances of the case, taking into consideration the objects of their use as described in the rationale, and the facility of obtaining them.

The work being designed for practical utility, those poisons only are treated of, which are used as such almost daily, either purposely or inadvertently; whilst those articles of the materia medica which, although poisonous, are only known to be such from express experiments, and never made use of, are not noticed.

The external poisons, comprising death by the bites of serpents and rabid animals, suffocation by poisonous gasses, strangulation, drowning, &c. are not treated of; but the author intends, should sufficient encouragement be given him in the sale of this work, to publish in a short time, a work on external poisons, in which a considerable quantity of original information, (the result of upwards of eighteen hundred experiments,) will be given.

Having spared no pains in the compilation of the work from the best modern ch sts, as Orfila, Vauquelin, Gay Lussac, Royer, Majendie, Davy, Christison and others, together with a number of experiments of his own, he flatters himself it will he found a useful manual to the medical student and practitioner.

New-York, Jan. 1822.

TOXICOLOGIA.

PART I.

ON GENERAL POISONING.

CHAPTER I.

ON THE PHYSIOLOGICAL ACTION OF POISONS.

In treating of this subject, we shall notice, first, the modus operandi of poisons, and secondly, the causes by which their action is modified.

SECTION 1.

ON THE MODUS OPERANDI OF POISONS.

The mode of action of poisons, and of remedies also, is either local or remote; or, as it is frequently, though we conceive erroneously termed, general—there being but very few, if any poisons, whose operation can properly be termed such.

The local action is of three kinds. First: By chemically decomposing or corroding the coats of the organ or organs to which they are applied. Secondly: Other poisons, without immediately injuring its organization, inflame and produce

irritation in the organ itself. Thirdly: The other mode of local action is, by making a peculiar impression on the sentient extremities of the nerves, unaccompanied by any visible change of structure. It is true of this mode of action, but few well authenticated and unequivocal instances are known. Mr. Brodie mentions a good example, in the effect of monkshood on the lips when chewed, which causes a sense of numbness and tingling on the lips, which lasts for some time, quite unconnected with any affection of the general nervous system. M. Robiquet felt the numbning impression of strong prussic acid, even on his fingers. The application of opium and ticunas, to the inner surface of the intestines of a rabbit, by Drs. Phillip, Morgan and Addison, caused paralysis of the muscular contractions of the gut, without producing any effect on the general system. The same effects have been observed from prussic acid, by M. Coullon and others. These facts prove the existence of local impressions of a purely nervous nature, and support the doctrine of the sympathetic operation of poisons.

In examining the remote action of poisons, we find, that their influence can only be conveyed from one organ to another by the sympathetic operation above mentioned, or, by the entrance of the poison into the bibulous vessels, and consequent mixture with the tide of circulation.

In the infancy of Toxicology, all poisons were believed to act by sympathy, or nervous impression. Majendie's experiments rendered the doctrine of absorption almost universal; but the latest researches, (in the opinion of Professor Christison,) tend rather to show, that some poisons act by sympathy, without entering the blood, and that, although many poisons do enter the blood, the operation even of these, nevertheless, consists of an impression made on the sentient extremities of the nerves, and conveyed thence,

along the filaments, to the brain or other organs. The physician, who has by his practice become familiar with the phenomena of disease, cannot doubt the reciprocity of influence among the various organs. There are, however, a large class of poisons, whose operation is so slow, that absorption has time to take place, and most probably does take place in a number of cases. Poisons are believed to act through the blood, for the following reasons. First: They disappear during life from shut cavities, that is, they become absorbed, of which numerous examples are on record, from the experiments of Coindet, Munro, Majendie, Brodie, Barry, Christison, &c. It has also been observed, that the absorbing power of the different tissues makes a great difference in the result. The most rapid channel of absorption is from a wound, or by express injection into a vein. The surface of the serous membranes is a less rapid medium; and the mucous membrane still less rapid. The activity of many poisons is modified, in proportion to the absorbing power of the tissue to which it is applied. If the extract of nux vomica is thrust into the paw of an animal, after a ligature has been tightened round the leg so as to stop the nervous, but not the arterial circulation of the limb, blood drawn from an orifice in a vein between the wound and ligature, and transfused into the vein of another animal, will excite in the latter the usual effects of the poison, so as even to cause death; whilst the animal, from which the blood has been taken, will not be affected at all, if a sufficient quantity is withdrawn before the ligature is removed. To these strong arguments, physiologists on the other side of the question have replied, that the disappearance of poison from a short sac, as well as other experiments, only prove, that poisonous substances do enter the blood, but do not prove that they are carried to the organs on which they act, or that such transmission is necessary.

If by the same test, (say they,) which has been adopted by Verniere, we attempt to prove the existence of the poison in the arterial blood, or in the general blood of the body, our efforts will fail completely. If, for example, the carotid and jugular vein of one dog be divided, and both ends of each reciprocally connected by proper tubes, with the divided ends of the carotid and jugular of another dog, and extract of nux vomica be introduced into a wound on the face or neck of one of them, this animal will perish in the usual time, while the other will remain uninjured. This experiment, (by Morgan and Addison,) proves, that the poison is not carried with the blood to the organ which is acted upon; although the above mentioned experiment of Verniere also clearly proves, that the poison actually enters the veins where it is immediately applied. The same reply may be given to the famous experiment of Majendie, on the effect of the extract of nux vomica, when the part where it has been applied communicates with the body only by means of two tubes, which join together the divided ends of an artery and vein. The experiment proves that the poison enters the blood, and in substance reaches the trunk, but it proves no more.

As to the experiment of Ernmert, it is sufficient to reply, that the maintenance of the circulation is essential to the right discharge of all the functions, and amongst the rest, to the integrity of all the acknowledged functions of the nerves; consequently, the non-action of a poison, when a ligature is applied on the vessel which supplies the part where the poison lies, is no proof that the poison acts through the blood. The argument which is drawn from the activity of many poisons, corresponding with the absorbing power of the textures to which they are applied, has not been touched on by the supporters of action by sympathy, but will presently be seen to harmonize with that doctrine, according to its newest modifications.

The same experimentalists have also shown, that if a poison be introduced into a great vein, with certain precautions for preventing its passage towards the heart, it nevertheless will act with unimpaired rapidity. Thus, if the jugular vein of a dog be secured by two temporary ligatures, then divided between them, and afterwards reconnected by a tube which contains woorara, we find, of course, on removing both ligatures, that the poison quickly begins to act. But it will act with the same quickness, if we remove only the ligature farthest from the heart, which is incompatible with the notion, that it must be carried with the blood to the brain, the organ that is affected by it. They have farther shown, that the operation of poisons, which appear to act through the blood, is not accelerated by introducing them into the artery, which supplies the organ acted upon.

If the counterpart of the former of the two foregoing experiments, be performed upon the carotid artery instead of the jugular vein, the woorara does not act more rapidly, as we should anticipate, did this poison act through the blood; and what is still more to the point, the action is not retarded when the poison is introduced in the same way into the femoral artery. On the contrary, in all these situations, in the carotid artery, the jugular vein, and the femoral artery, it acts with the same quickness, which is inconceivable, if it act on the brain through the blood, since in the first situation it passes instantly into that organ, and in the last it accomplishes its course only after passing through the whole systematic and pulmonary circulation. In order to explain the continuance of the action of poisons, when, as in Majendie's experiment, the part directly poisoned communicates with the trunk by blood vessels only, or when, as in their own experiment, the poison is introduced into a vein, but prevented from reaching the heart, they suppose that, like the other membraneous ca-

vities of the body, the inner surface of the vascular system is supplied with an expansion of nervous filaments, on which poisons produce their peculiar impressions, and from which these impressions are communicated along the nerves to remote organs. In order, however, to account also for the correspondence observed between the activity of poisons, and the activity of absorption in the several textures to which they are applied, it would be further necessary to maintain, that the nervous expansion of the inner membrane of the blood vess , is more peculiarly fitted, than the sentient extremities of the nerves elsewhere, for receiving the impressions made by poisonous agents; nay, perhaps, that it is the only nervous expansion which possesses that function, except in regard to those poisons which cause evident organic injury, such as inflammation or corrosion.

This important doctrine, is one to which Morgan and Addison evidently lean, although they have not adopted it so explicitly. These ingenious experiments and theories do not, in the opinion of Christison, contradict the general principle, that the bibulous veins, as the organs of absorption, perform a very material part in the operation of poisons. That many poisons do enter the blood, there is not the least doubt, although it is not equally certain that any pass with the blood to pervade the structure of the organ acted on. In respect to physiology, as well as medical jurisprudence, it becomes a matter of great interest to detect poisons in the circulating fluids; for, if it can be proved that poisons act generally through the medium of the nerves rather than of the blood vessels, there can be no doubt but that remedies act in the same manner. Much, however, yet remains to be discovered by some future genius, and it is to be hoped, that the time is not far distant when much of the uncertainty that at present envelopes this subject, will be removed.

On the organs affected by the remote action of poisons, it may be necessary to make a few observations. A few of the poisons, such as arsenic and mercury, appear to affect a great number of organs of the body at the same time. But the much larger proportion seem to act on one or more organs only, and not on the general system: some act, sympathetically, on the heart alone. The mineral acids do not enter the blood, and the symptoms they produce, excepting their direct local injury, are those of depressed action of the heart. In this manner, tobacco and the upas antiar act principally on the circulation, with many other poisons that act on other organs at the same time, as arsenic and oxalic acid.

Some poisons act strongly but not solely on the lungs. In poisoning by tartar emetic and corrosive sublimate, the lungs are commonly inflamed, and sometimes hepatized. A considerable number act on the brain, as the narcotic and narcotic acids, producing convulsions, delirium, paralysis, coma. Post mortem effects, as congestions or extravasation, are, however, rare and equivocal. This will not, however, hold good with those that appear to act solely on the heart or spine, as tobacco and strychnia. It is probable that most poisons which have a range of remote action act through the medium of the brain. There are but few that act specifically on the spinal cord: the only ones with which we are acquainted, are nux vomica, the other plants that contain strychnia, and the false Augustura bark. The organs not immediately vital may also be acted upon indirectly by various poisons; this is sufficiently obvious, and there is scarcely any considerable organ in the body, except, perhaps, the spleen and pancreas, which may not be acted upon by some poison or other.

SECTION 2.

ON THE CAUSES THAT MODIFY THE ACTION OF POISONS.

The action of poisons may be greatly modified, both in degree and kind, by a variety of causes. Those we shall enumerate are,

First: Quantity,—which not only enables them to produce their effects more rapidly, but sometimes materially affects their action, not only in rapidity and degree, but in kind also, as is the case with oxalic acid, arsenic, veratrum album, and some others.

Second: State of aggregation. This materially affects the operation of poisons, as all poisons act the more energetically the more minutely they are divided; and, as a consequence, more powerfully when in solution, than when in substance. Some poisons which scarcely act at all, or very slowly, when in substance, act with great rapidity and energy when in solution, as morphia. The manner in which solution favours their action is by diffusing them more quickly over a large surface, and also by fitting them by a more minute division for entering the bibulous vessels, and thus operating either through the medium of the circulation, or by producing an impression on the extremities of the nerves connected with those vessels through the nerves themselves, upon the general system or separate organs. The state of aggregation also affects the kind as well as the degree of action, as camphor which produces different effects, when taken in fragments, to those when taken in oil.

Third: Chemical combination. This is sometimes only a variety of the last cause, as, if the substance with which it is combined increases its solubility, it generally increases its activity, and vice versa. Hence the solubility and conse-

quent activity of opium or morphia is much increased by being taken in a vegetable acid. In the same manner barytes may be rendered inert, by the addition of sulphuric acid, which unites with the barytes in solution, and forms the insoluble sulphate.

Fourth: Mixture. This is a combination of the two former causes, and its effect either depends on dilution, which sometimes lessens their activity, and sometimes increases it, or on the chemical alteration produced by the addition of any other substance or fluid. See the preceding cause.

Fifth: Difference of tissue. The difference of tissue materially affects the action of poisons, which is, no doubt, both owing to the different degrees of rapidity with which the poison is absorbed, and also to the obstacles to be met with in the application of the poison, to the extremities of the nerves. On the cutaneous tissue the absorption is slow, on account of the obstacles presented by the cuticle, and the intricate capillaries of the true skin. On the mucous membranes of the stomach and intestines, they act with more energy than on the cuticle, arising, as we have before observed, from the increased rapidity of absorption, and also from the facility with which they are brought in contact with the sentient extremities of the nerves. On the serous membranes their activity is much increased, as those membranes possess an activity of absorption which can scarcely be equalled by any other unbroken texture.

Sixth: Difference of organ. This may generally be attributed to the difference of tissue, as the various tissues may, in various organs, be presented to the action of the poison and may also themselves be variously modified.

Seventh: Habit and idiosyncrasy. If habit does not entirely destroy the effect of poisons, yet it will frequently lessen them. We have cases in point in those individuals who accus-

tom themselves to the use of opium or tobacco. The general effect of these causes, when combined, is such that some substances which are poisonous to some persons, are harmless to others. And the effect of idiosyncrasy may be acquired by some individuals, so that what is nutritive at one period of life, is sometimes highly injurious at another, yet as a general rule, idiosyncrasy does not materially impair the energy of poisons, although habit frequently or always does.

CHAPTER II.

ON THE EVIDENCE OF GENERAL POISONING.

The evidence of general poisoning is purely medico-legal, and is derived from the following sources: the symptoms—the port mortem appearances—chemical analysis—experiments on animals—and moral circumstances. In treating of the evidence of general poisoning, it will be remembered that we do not refer to any particular poison.

1. *Evidence from Symptoms.*

It is not many years since questions of poisoning were decided by the evidence presented by the symptoms alone. But no such evidence is now trusted to per se. In some cases of poisoning, the evidence arising from symptoms, is almost conclusive, as the mineral acids, arsenic, sublimate, and strychnine; but they are in general only auxiliaries. The chief characteristics of the symptoms in poisoning, are suddenness of appearance; rapidity of progress to a fatal termination; steady increase; uniform in their nature; begin soon after food, drink, or medicine has been taken; the patient's being

previously in a state of health. Although these are the general, or rather constant, characteristics, yet the exceptions to each of them are numerous and evident; and consequently they ought to be examined cautiously; agree in themselves, and with the subsequent evidence. The first characteristic is very liable to exceptions, when the dose is small. As arsenic, digitalis, strychnine, and several other poisons, may be introduced into the system slowly, and yet so as to produce their specific and fatal effects at last.

There are also a number of natural diseases which, in some instances, commence, proceed, and terminate in the manner in which poisons do, and of course throw much doubt on symptomatology taken alone. Thus, for example, with respect to the appearance of symptoms of poisoning soon after a meal, it is well known that some of the most fatal disorders commence at this time, as apoplexy, cholera, perforation of the stomach from chronic inflammation, &c. It ought, however, to be remembered, that there are few diseases which commence immediately after food has been taken, and proceed to a rapid and fatal termination; and of even those which do so, their occurrence is by no means frequent. The occurrence of such circumstances will, therefore, be justly looked upon with suspicion. The same may be said of the other characteristics above noticed. Hence, as a general rule, should the symptoms of poison not commence soon after food, drink, or medicine has been taken into the stomach, (the circumstances of course precluding the possibility of the poison being introduced by a wound, by the lungs, or by any other channel but the stomach,) the presumption, on the whole, is against poisoning, and sometimes the evidence to this effect is decisive. This is an important principle in medical jurisprudence; for when united with a knowledge of the symptoms antecedent to death, it may be sufficient to decide the

nature of the case. But in cases in which the effects do commence soon after food, drink, or medicine has been taken, should the post mortem examination produce no appearances of natural disease, (and even where there are appearances of natural disease, their weight ought to be carefully considered,) the evidence would certainly preponderate in favour of the position that poison had been taken, yet, from the symptoms alone, no certain criteria can be drawn, though much auxiliary information.

2. *From Morbid Appearances.*

The evidence derived from this source had formerly, (like that derived from symptoms,) great weight, and often with much less reason: for, if we except a very few poisons, the morbid appearances alone can never conclusively enable us to distinguish between their effects, and those of natural disease, or violent death. Lividity of the body and early putrefaction are still thought by the vulgar to be conclusive evidence of poisoning, although there is not the least foundation for such an opinion. The post mortem appearances are signs of inflammation of the intestinal canal, and its products, in one class of poisons—congestion of the cerebral vessels in another—and in a third a combination of both. But neither set of appearances are the invariable products of the poisons which usually induce them. Congestion of the brain is not always caused by those poisons which are generally believed to produce them; and, in short, all the appearances are subject to much modification, by contingent circumstances, and are frequently similar to those caused by many natural diseases. The post mortem appearances, although not exclusively to be depended upon, must not be neglected, as when taken in combination with the other kinds of evidence, they will materially assist the investigation, and be entitled to considerable weight.

3. *From Chemical Analysis.*

This is the most decisive of all the branches of proof, and its validity stands in the following order: First, when detected in the æsophagus, stomach, or intestines—next, in the ejections—then in the articles of food, drink or medicine, of which the patient has partaken—and lastly, in any articles found in the prisoner's possession, for which he cannot account. The evidence derived from this source, ought to be minutely investigated, and is not so conclusive as would appear at first sight; for even when poison is discovered in the stomach, it may be sometimes rather a doubtful question whether death was produced by it, or by some other cause. Wildberg* relates a case in point. "He was required to examine the body of a girl who died while her father was in the act of chastising her severely for stealing, and who was believed by all the bystanders, and by the father himself, to have died of the beating. Accordingly, Wildberg found the marks of many stripes on the arms, shoulders, and back, and under some of the marks blood was extravasated in considerable quantities. But these injuries, though severe, did not appear to him adequate to account for her death. He therefore proceeded to examine the cavities, and on opening the stomach he found it very much inflamed, and lined with a white powder, which on analysis proved to be arsenic. It turned out, that on the theft being detected, the girl had taken arsenic for fear of her father's anger, that she vomited during the flogging, and died in slight convulsions." Consequently, Wildberg very properly imputed death to the arsenic. In this case the chemical evidence proved that arsenic had been taken, but an account of the symptoms and appearances, was necessary to prove that she died of it.

* Wildberg. Praktisches Haudbuck fur Physicker, iii, 227.

Another case occurred to Pyl,* in 1783. "A woman at Berlin, who lived on bad terms with her husband, went to bed in perfect health ; but soon afterwards, her mother found her breathing very hard, and on enquiring into the cause, discovered a wound in the left side of the breast. A surgeon being immediately sent for, the hæmorrhage, which had never been great, was checked without difficulty, but she died nevertheless, towards morning. On opening the chest, it appeared that the wound pierced into it, and penetrated the pericardium, but did not wound the heart, and although the fifth intercostal artery had been divided, scarcely any blood was effused into the cavity of the chest. Coupling these circumstances with the trifling hæmorrhage during life, and the fact that she had much vomiting and some convulsions immediately before death, Pyl satisfied himself that she had not died of the wound, and accordingly, the signs of corrosion in the mouth and throat, and of irritation in the stomach, with the subsequent discovery of the remains of nitric acid in a glass in her room, proved that she had died of poison."

It sometimes occurs, that the poison, after having been taken and produced death, cannot be detected by chemical analysis. There are three causes which may remove it from discovery. First, it may have been discharged by vomiting or purging ; secondly, it may have been absorbed ; or, thirdly, decomposed.

The first of these causes is of very frequent occurrence ; and the inattenion of the attendants in removing the ejections, of course prevents discovery. In the trial of George Thorn, for poisoning the Mitchells, on the Aberdeen circuit, in 1821, it was clearly proved, that the deceased died from the effects of arsenic, although none could be detected in the stomach ; for the man lived seven days, laboring under incessant vomit-

* Aufsatze und Beobachtungen, &c. ii, 122.

ing. Yet it is singular how ineffectual vomiting often proves, in the expulsion of some poisons from the stomach. Arsenic, and some others which are not easy of solution, may remain adhering to the villous coats, notwithstanding repeated and violent efforts to dislodge them by vomiting.

The fact that poisons are frequently absorbed, and thus removed from discovery, is now clearly established. A number of instances have frequently occurred, in which laudanum, and even solid opium, have been taken into the system, by absorption, so as not to be within the reach of chemical analysis. Dr. Christison and Mr. Newbigging, could not detect laudanum in the body of one who had undoubtedly swallowed it, and who died in about eight hours. Pyl relates a similar instance. But absorption is not confined to opium alone. Dr. Christison relates a case, in which arsenic had been taken, and the patient only lived five hours, and yet he could only detect the one-fifteenth part of a grain in the contents and coats of the stomach. A case is related in an American Journal—(if we do not mistake, it is in the Philadelphia Medical Recorder for 1822)—where a man swallowed an ounce of arsenic, and died in eight hours, yet no poison could be detected by chemical analysis. There cannot be the least doubt, but that great errors have been committed by medical witnesses, in consequence of overlooking the fact of absorption.

Lastly, the excess of poisons may be decomposed. Vegetable and animal substances may be altogether destroyed by the process of digestion. Christison relates the case of a French soldier, who, having taken two drachms of solid opium, died in six hours and an half, but neither the poison nor its usual smell could be detected after death. Some mineral poisons, as hydr. oxymur. argenti nit. are also sometimes decomposed in the stomach, but are not removed beyond the

reach of chemical analysis. The decomposition, in such cases is a chemical, not a vital process, and the base of the poison may be found in the solid contents of the stomach, under some other compound form. The decomposition of the body may also render it impossible to detect poison that has been actually taken into the stomach. Oxalic acid (and probably some other poisons) may be dissolved and then exude; vegetable narcotics may putrefy, and prussic acid may be volatilized. Arsenic has however been detected in the body fourteen months after death. Such are the apparent contradictions of the action of poisons on the human system.

4. *From Experiments on Animals.*

The evidence derived from this source is more equivocal than it was formerly considered; but there can be no doubt but some jurists have overstepped the proper limits in rejecting this species of proof in toto. An important objection to this species of evidence, is the fact, that what is poison to man is not always poison to animals, and vice versa. The dog and the cat are affected by almost all poisons, nearly in the same manner as man, but the dog more particularly; hence, in making experiments to test the presence of any poisonous substance, these animals must of course be selected.

In general, poisons act less violently on these animals than on man. Thus, as a general rule, two drachms of opium are required to kill a middle sized dog, whilst thirty-six grains have killed a man, and probably much less would in some cases have been sufficient for the purpose. It appears that alcohol acts more powerfully on them than on man. There are also some poisons, such as opium, which, although deleterious to them, as well as to man, nevertheless produce in general different symptoms. Yet these differences are not

greater, perhaps, than exist between man and man in regard to the same substances; but on the whole, it may be assumed that the effects of poisons on the dog and cat, differ but little from those produced on man.

The effects of poisons on man may be developed so characteristically on animals, by the contents of the stomach, either taken accidentally, or given purposely, as to supply generally very pointed, and in some cases, conclusive evidence.

The following example is a striking illustration of the correctness of this statement: In the case of a girl, who was proved to have died of accidental poisoning with laudanum, the inspector evaporated the contents of the stomach to dryness, made an alcoholic extract from the residue, and giving this to several dogs, chickens, and frogs, found that they were all made lethargic by it, some of them oftener than once, and that a few died comatose. Facts such as this, agreeing so pointedly with the known effects of the poison suspected, appear to me to yield evidence almost unimpeachable.

5. *From Moral Circumstances.*

The heads of moral evidence, to which the medical jurist ought to direct his attention, and which will frequently materially assist him in making a correct decision on the case, are the following:

1. To suspicious conduct on the part of the prisoner, before the event, such as dabbling with poisons, when he has nothing to do with them in the way of his profession, conversing about them, or otherwise showing a knowledge of their properties, not usual in his sphere of life. 2. To the purchase or possession of poison recently before the date of the alleged crime, and the procuring it under false pretences, such as for poisoning rats, when there are none on his premises to poi-

son; or for purposes to which it never is applied. 3. To the administration of poison, either in food, drink, medicine, or otherwise. 4. To the intent of the prisoner, such as the impossibility of his having administered the poison ignorantly, or by accident, or for beneficial purposes, alleged or not alleged. 5. To the fact, that other members of the family, besides the deceased, have been similarly and simultaneously affected. 6. To suspicious conduct on the part of the prisoner during the illness of the person poisoned; such as directly or indirectly preventing medical advice being procured, or the relations of the dying man being sent for, or showing an over-anxiety not to leave him alone with any other person, or removing or destroying, or attempting to remove or destroy, articles of food, drink, or vomited matter, which may have contained the poison; or expressing a fore-knowledge of the probability of speedy death. 7. To suspicious conduct after the person's death, such as hastening the funeral, preventing or impeding the inspection of the body; giving a false account of the previous illness, showing an acquaintance with the real or supposed effects of poison on the dead body. 8. To the personal circumstances and state of mind of the deceased, his death-bed declaration, and other particulars, especially such as tend to prove the impossibility or improbability of suicide. 9. To the existence of a motive or inducement on the part of the prisoner, such as his having a personal quarrel with the deceased, or hatred of him; his succeeding to property by his death, or being relieved of a burden by it; his knowing that the deceased was with child by him. It will be sufficiently obvious, that the above points of evidence, either separately or collectively, are valuable auxiliaries to the jurisprudent. But he ought forcibly to impress upon his mind the important maxim, that we cannot examine too closely, think too deliberately, or decide too impartially on subjects of such importance.

To those who have examined the subject with the least attention, it will be obvious, that the evidence arising from all these sources ought to be minutely examined, and an opinion formed, not from one class of evidence alone, but from a combination arising from the various sources: and it is only when these various classes of evidence can be brought to bear upon, and agree with each other, that a decision can be satisfactorily made. It is true, there may be some instances in which it would appear that evidence derived from only one class, would appear conclusive; but if apparently conclusive evidence is derived from one class, it is only from neglect, that evidence is not brought to bear on the case from another class also. Thus, for example: if a person, soon after food, drink, or medicine has been taken, complains of violent colic, general pains in the abdomen, vomiting, pulse small and hard, obstinate costiveness, laborious respiration, paralysis of the extremities, prostration of strength, delirium, and ultimately expires under these symptoms, the presumption would immediately be, that he had died by poison; but what medical jurist would take that presumption, and without the concurrent evidence of morbid appearances, or chemical analysis, state it as a fact from symptoms alone? None. All the evidences we can possibly derive from every source, must be carefully examined, and weighed with each other, in order to form a correct decision.

After the preceding observations on general poisoning, the next part of the work will be devoted to the consideration of those individual poisons which are commonly taken either as poisons or remedies, whilst those which are never taken by man, either intentionally or accidentally, will be excluded, as being more objects of curiosity than utility.

PART II.

METALS.

SILVER.

ARGENTI NITRAS. NITRATE OF SILVER. LUNAR CAUSTIC.

Character and Chemical Composition.—A cylindrical mould of a grey colour: fracture, irradiated: taste, bitter and metallic: odour, none.

Chemical Composition.—

Oxide of silver,	70
Nitric acid,	30=100

Solubility.—It is soluble in an equal weight of water at 60°, and is readily soluble in alcohol.

Medical Use and Dose.—It is seldom used internally. In doses of $\frac{1}{10}$ of a grain to 1 grain it may, however, be given as a tonic and antispasmodic. Externally, it is an escharotic, both in substance and solution, for the solution, from 2 to 10 grains may be dissolved in an ounce of distilled water.

Symptoms when taken as a Poison.—*Primary*—Corrosive and acid taste in the mouth and throat, together with a sensation of fulness and choking; great anxiety and severe pain in the epigastric region. *Secondary*—Vomiting; diarrhœa; pulse quick and small; fainting; cramps; small quantities of blood and frothy mucus are discharged from the stomach; tenesmus; convulsions; death.

Remedies.—The stomach pump is the best and most certain remedy for this, or almost any other poison ; as by its means, the poison can be extracted from the stomach much quicker than by the tedious, and sometimes uncertain process of vomiting, induced by emetics ; as frequently the stomach is so overcome by the action of the poison, as to be unable to throw off its contents, even when stimulated to action by the most powerful emetics we can employ. The æsophagus also, either partaking in the general torpor of the system, or excessively swollen by the corrosive effects of the poison, refuses to swallow any liquid. In such cases, the stomach pump is our only resource. We would wish, therefore, to impress strongly upon the mind of the student, that the stomach pump is an indispensible requisite in general cases. It is true, that it is sometimes more advisable to use those antidotes which neutralize the poison, by producing chemical decomposition ; but, as a general rule, it will be much better, (where it can be done,) first to apply the stomach pump, and afterwards the antidote, in order to decompose the remainder of the poison ; but when the pump is not at hand, no time should be lost in employing the antidotes recommended. In poisoning by nitrate of silver, give immediate and large draughts of a solution of muriate of soda, in water ; in about an hour afterwards, either an emetic of 20 grains of ipecacuanha, or 10 to 20 grains of sulphate of zinc, (which induces vomiting with very little nausea,) or a full dose of sulphate of magnesia ; venesection ; fomentation of the stomach and bowels ; emollient injections, and the tepid bath. *Rationale*—The use of the stomach pump and emetics are obvious ; the salt, or muriate of soda, forms in the stomach an insoluble compound, (the muriate of silver,) which is inert, and may be removed by either an emetic, or a dose of salts. The subsequent treatment is intended to subdue the inflammatory symptoms,

which may have arisen either from the first efforts to expel the poison having been ineffectual, or from not having taken the antidote in sufficient time.

Morbid Appearances.—Inflammatory patches are observed in the mucous coats of the stomach and intestines, some portions of which are corroded and detached; dark and gangrenous spots; the larynx in a state of extreme inflammation. The cause of death appears to be inflammation and gangrene of the stomach and intestines, produced by the corrosive nature of the poison.

Tests.—Collect and filter the contents of the stomach, and if necessary, wash it in distilled water previous to submitting it to the following tests. The addition of a small quantity of oxydum arsenicum throws down a yellow precipitate, which is the arsenite of silver. Ammonia will not affect the solution, but potass and soda precipitate it. The muriates of alkalies, earths and metals decompose it, precipitating a white powder which soon turns black by exposure to the light. A stick of phosphorous dipped into the solution will precipitate the silver in a metallic state.

HYDRARGYRI OXYMURIAS. OXYMURIATE OF MERCURY. CORROSIVE SUBLIMATE.

Character and Composition.—This poison is commonly met with in the form of small prismatic crystals, (which become opaque on exposure to the air,) or of a heavy snow white powder: taste, strongly styptic, acrid and metallic: odour, none.

Chemical Composition.—This is a bi-chloride of mercury, consisting of

Mercury,	25	73.53
Chlorine,	9	26.47=100

Specific gravity, 5.14.

Solubility—It is soluble in eleven parts of pure water, and three parts of boiling water, to one part of the salt. Boiling alcohol dissolves its own weight, and contains one quarter when it cools: it is very soluble in ether, which will remove it from its aqueous solution.

Medical Use and Dose.—Internally it is stimulant, and antisyphilitic, in doses of from $\frac{1}{16}$ to $\frac{1}{4}$ of a grain in pill or solution. Externally, it is used as an escharotic, in cutaneous and cancerous diseases, and as a gargle in ulcerous sore throats. The usual dose is from 2 to 4 grains, dissolved in a pint of water.

Symptoms.—Primary—Burning, and metallic taste in the mouth; sense of swelling and constriction, combined with great oppression in the throat; difficulty of swallowing; anxiety; acute pains in the stomach and bowels. *Secondary*—Frequent and violent vomiting; pulse quick and hard; diarrhœa; copious salivation; great debility; difficulty of respiration; tremors; convulsions; death.

Remedies.—Give immediately large quantities of albumen (white of an egg) in water, or gluten,* and copious draughts of warm water. According to Peschil, the white of one egg renders 4 grains of the poison innoxious. There should be no delay in administering the albumen or gluten, as fatal consequences may speedily take place. When neither albumen nor gluten can be obtained, milk will be the best article. Should inflammatory symptoms supervene, bleeding, with emollient injections, as milk, &c. will be found necessary. *Rationale*—The albumen of the egg decomposes the oxymuriate, and reduces it to the state of submuriate, or calomel, which may be

* Gluten—This has been ascertained by Taddei of Naples to be equally an antidote with albumen as it decomposes the oxymuriate, &c. Does not this fact in the history of this substance show an important analogy between this essential vegetable principle, and the no less essential animal one, albumen? Note by Prof. Channing, of Harvard University.

allowed to pass off by the bowels, or be evacuated by vomiting. The use of the lancet &c. is obvious.

Morbid Appearances.—Redness, blackness, and even gangrene of the mucous membrane of the stomach and intestines, with frequent perforations of their coats; constriction of the æsophagus, and first portion of the duodenum; the pylorus is highly inflamed, and portions of its mucous membrane detached. The cause of death may be either immediate or secondary; the immediate cause appears to be the stoppage of the heart's action, the secondary cause, inflammation and gangrene of the mucous membrane of the stomach and intestines. This poison may destroy life by being absorbed into the system, but its primary effect is usually too quickly destructive to permit its absorption.

Tests.—Collect and dry the white sediment that may be found in the stomach and intestines, mix it with three times its weight of black flux, and introduce it into a dry thin glass tube, stopping the open mouth of the tube loosely with paper; expose the closed end to the heat of a spirit lamp, and if present, the sublimate will rise to the top, lining the inside of the tube with a shining metallic crust. Add to a watery solution of the powder thus obtained, a small quantity of lime water, and an orange-coloured precipitate will be the immediate result. One drop of a solution of the carbonate of potass will occasion a white precipitate, and a further addition, one of an orange colour. A stream of sulphuretted hydrogen gas will give a dark coloured precipitate. Place a small quantity of the suspected solution on a plate of glass, and near it, a similar quantity of sulphuric acid, (diluted with five times its weight of distilled water,) bend a piece of zinc or iron wire in the form of the Greek letter Π, tying the ends to a gold ring; then bring the wire into contact with the acid, and the ring with the solution, and if the smallest quantity of the corrosive

sublimate is present, the ring will be immediately covered (at that part touching the solution) with mercury. A simple method of obtaining the same test, is to put a drop of the mercurial solution on a polished plate of gold, and then touch the gold, through the solution, with the point of a small iron wire. If the sublimate has been taken in wine, coffee, or any coloured fluid, shake it slowly in a phial for ten minutes, with three drachms of sulph. ether; pour off the ether after the fluid has separated by rest, and evaporate the remainder, when the sublimate will remain in the solid form, which may be exposed by the above tests.

The hydriodate of potass, causes, in solutions of corrosive sublimate, a beautiful pale scarlet precipitate, which rapidly deepens in tint. The precipitate is the iodide of mercury. This is a test of very great delicacy, when carefully used; care must be taken not to add too much of the test, because the precipitate is very soluble in an excess of the hydriodate, or too little, as it is soluble in a considerable excess of corrosive sublimate. Hydrochlorate of soda, nitrate of potass, and probably, also, other neutral salts, possess the power of dissolving the precipitate. Sulphuric and nitric acids, even considerably diluted, oxidate and dissolve the mercury, and disengage the iodine which colours the fluid reddish brown. When the poison is combined with coloured vegetable or animal fluids, this test cannot be relied upon, the colour of the precipitate being altered. Milk entirely suspends the action of the test.

The following are a number of tests which have been used, but which are not so delicate as the previous ones: 1. Lime water throws down the peroxide of mercury in the form of heavy yellow powder. 2. Caustic potass has the same effect. 3. Caustic ammonia throws down a fine white flocculent precipitate, which is a triple compound of ammonia, chlorine,

and mercury. It is a delicate but uncertain test, as ammonia also causes a white precipitate in other metallic solutions. 4. Carbonate of potass throws down a brick red precipitate. 5. The ferro-cyanate of potass causes, at first, a white precipitate, which becomes slowly yellowish, and afterwards of a pale blue colour. 6. A polished plate of copper immersed in a solution of corrosive sublimate, becomes, in a few seconds, tarnished and brownish; and in the course of half an hour, a grayish white powder is formed on its surface. If it is wiped off, and the plate briskly rubbed, it assumes a white argentine appearance.

COPPER.

SULPHAS CUPRI. SULPHATE OF COPPER. BLUE VITRIOL.

Character and Composition.—It exists in rhomboidal prismatic crystals of a deep blue colour: taste, harsh, acrid, astringent, and metallic: it is inodorous.

Composition.—It is a bi-sulphate of copper, and consists of

Acid,	31.38	2	primes,	10.00	32.0
Oxide,	32.32	1	do.	10.00	32.0
Water,	36.30	10	do.	11.25	36.0
	100.00			31.25	100.0

Its specific gravity is 1.150, at 42°.

Medical Use and Dose.—It is used internally as an immediate emetic, and is in many cases preferable to tartarized antimony, as it induces vomiting quicker. The dose is from 2 to 10 grains. Externally, it is escharotic in substance or solution, for which from 20 to 30 grains to half a pint of water are used.

Symptoms.—Primary—Violent head-ache; tongue dry and parched; sense of strangulation; great nausea; coppery

eructations. *Secondary*—Severe colic; continued vomiting, or violent attempts to vomit; black and bloody discharges from the intestines; pulse small, quick, and irregular; great thirst; difficulty of breathing; cramps; prostration of strength; convulsions; death.

Remedies.—The best remedy is, probably, either albumen or gluten, which may be given in the same manner as in oxymuriate of mercury. The ferro-cyanate of potass is nearly, if not equally, as good an antidote; but where neither can be obtained, give large doses of milk, or sugar and water, to induce vomiting, continuing the draughts in moderate quantities for some time afterwards. Should inflammatory symptoms supervene, employ venesection, fomentations to the abdomen, and emollient injections. *Rationale*—The albumen, gluten, and ferro-cyanate of potass, produce chemical decomposition; the use of the syrup is intended to induce vomiting, and defend the coats of the stomach from the corrosion of the poison; but if the contents of the stomach be not evacuated, not much dependence can be placed upon the syrup.

Morbid Appearances.—The skin on the head and face is yellow, and on the lower extremities, of a livid colour; the stomach and intestines inflamed; coats of the stomach thickened, and sometimes of a green colour; pyloric orifice nearly obliterated; gangrenous patches, and some perforations, which allow of the contents of the stomach passing into the cavities of the abdomen; the colon, cœcum, and rectum, frequently ulcerated. The cause of death is inflammation and gangrene of the stomach and intestines.

Tests.—A small quantity of pure ammonia imparts a beautiful blue colour to the liquid containing the salts of copper; adding a sufficient quantity to neutralize the acid, when the copper has been received through the medium of any dishes

in which vinegar has been employed. The addition of caustic potass throws down a fine azure blue precipitate, which is the hydiated peroxyde of copper. A few drops of recently prepared tincture guiacum, added to the solution of the salts of copper, produces a blue colour, and if the quantity of salt is very minute, the addition of a few drops of prussic acid will instantly turn to green, and at length disappear. This is the most delicate test known for detecting the salt. If the poison is swallowed in wine, or any coloured fluid, a small quantity of chlorine will discharge the colour, when the prussiate of potass, will throw down a brown precipitate. A clean piece of steel or a stick of phosphorus will become coated with the metal, if immersed in a solution of the salts. The ferro-cyanate of potass causes a fine hair-brown precipitate, the ferro-cyanate of copper. Oxide of arsenic with the previous addition of a few drops of ammonia, throws down a fine apple green, or grass green precipitate, the arsenite of copper.

SUBACETAS CUPRI. VERDIGRIS.

Character and Composition.—It exists in bluish green crystals, hard and folaceous: taste, harsh and acrid: inodorous:

Composition.—

Acetas cupri,	43
Oxide nigra, do.	27
Aqua,	30=100

It is soluble in four parts of water at 60°.

Medical Use and Dose.—*Internally*, it is seldom applied either as a tonic, or emetic; dose as a tonic $\frac{1}{4}$ of a grain; emetic from 1 to 2 grains. *Externally*, it is applied to the callous edges of ulcers, and as a tonic to scorbutic ulcers, in a solution of from 1 to 2 grains in an ounce of water.

Symptoms &c.—Same as sulph. cupri, which see.

LEAD.

PLUMBI ACETAS. SUGAR OF LEAD.

Character and Composition.—Irregular masses forming an aggregation of four-sided prisms: taste, sweet and astringent: odour, slightly acetous.

Composition.—

Oxide of lead,	58
Acetic acid,	26
Water,	16=100

Specific gravity, 2.345. It is soluble in 25 parts of water, at 60° or 180°; readily soluble in alcohol.

Medical Use and Dose.—*Internally*, it is used as an astringent in visceral and uterine hæmorrhage, in doses of from ½ to 1½ grains, made into a pill with ½ a grain of opium. *Externally*, cooling and sedative in local inflammations, and burns; as a collyrium, it is made into a lotion by adding from 20 to 30 grains to 4 ounces of distilled water. It is a stimulant in strong solution of 1 drachm to 4 ounces of distilled water.

Symptoms.—*Primary*—Violent colic and general pains in the abdomen; vomiting; pulse small and hard; anxiety and tremor. *Secondary*—Obstinate costiveness; continued vomiting, laborious respiration; great increase of pain in the abdomen; loss of muscular power, and paralysis of the extremities. When death ensues it is usually preceded by great prostration of strength, delirium and insensibility.

Remedies.—In general cases bleeding may be resorted to, after which brisk cathartics, as castor oil, the sulphates of magnesia, or soda; in about an hour afterwards two or three grains of opium must be exhibited, and, if necessary, repeat-

ed in half an hour. This is the general treatment as recommended by physicians, but I have found the best results from the adoption of the following plan: Give immediately a full dose of sulphate of magnesia; then an injection of a solution of one drachm of assafœtida, and three grains of opium in a pint of warm water; fomentations may also be applied to the abdomen, as also venesection if necessary. When there is delay in obtaining the opium and assafœtida for the injection, mutton broth, or any oily fluid will be found useful. *Rationale*—The use of the lancet is intended to check the inflammation which may supervene, and to relieve the oppression from the respiratory organs. The sulphates of magnesia and soda, decompose the acetate, and form the insoluble and inert sulphate of lead. The opium is intended to allay irritation, and relieve the oppression on the respiratory system. The injections of assafœtida and opium act as sedatives and antispasmodics, and are of invaluable utility in cases of poisoning with the preparations of lead, or in colica pictonum. The uses of the oil, fomentations, &c. are obvious.

Morbid Appearances.—In those cases in which death has not been sudden, the mesentric and lymphatic glands are in a state of great vascularity, and the lungs are gorged with blood. Where death has rapidly taken place, the abdominal viscera will be found in a state of inflammation, with occasional patches of extravasated blood. The salts of lead do not produce such severe disorganization in the system, as those of copper. *Cause of Death*—The salts of lead act on the system by producing a suspension or destruction of the nervous power, and occasion death by suffocation, from paralysis of the respiratory muscles.—(Paris.)

Tests.—The addition of sulphuric acid occasions a white precipitate, which is the sulphate of lead. A stream of sul-

phuretted hydrogen gas, a black precipitate, the sulphuret of lead. Subcarbonate of soda, a very minute white precipitate, the carbonate of lead. The sulphates of soda, or magnesia, a white precipitate, the sulphate of lead, which is insoluble in acetic acid. Chromic acid, or the chromates, a yellow precipitate, the chromate of lead, or king's yellow. Muriatic acid, or muriate of soda, a white precipitate, the muriate of lead. A plate of zinc when immersed in a solution of the salts of lead, becomes black, and is shortly covered with minute scales of the metal: the infusion of galls produces a yellowish white precipitate, the gallate of lead. Sulphuret of ammonia, or potass, precipitates a dark coloured powder. If any of the above precipitates be melted with black flux, metallic lead will be detected.

PLUMBI SUBCARBONATE. WHITE LEAD.

Character and Composition.—White, brittle, minute crystals, or a heavy snow white powder: taste, sweet, and slightly astringent: inodorous.

Composition.—

Oxydum plumbi flava,	83.5
Acidum carbonic,	16.5=100

Medical Use.—*Internally* it is not used. *Externally*, escharotic; for this purpose, it is sometimes used, by sprinkling a few grains on the sore. The practice is, however, rather doubtful, both as to efficacy and safety. It is used chiefly in making plasters.

Symptoms, Remedy, &c, same as plumbi acetas, which see.

Tests.—This poison may be known, by its being blackened (like the sugar of lead) by sulphuretted hydrogen gas; by being soluble with effervescence in nitric acid; and by becoming permanently yellow, when heated to redness, in con-

sequence of the expulsion of its carbonic acid, and conversion into protoxide.

ZINCI SULPHAS. SULPHATE OF ZINC.

Character and Composition.—This poison exists in the form of white semi-transparent and efflorescent four-sided prismatic crystals: taste, styptic, metallic, and slightly acid: inodorous.

Composition.—

Oxide zinci,	20
Sulph. acid,	40
Aqua,	40=100

Specific gravity, 1.534, at 42°.

Solubility.—In 3 parts of water, at 60° and less than one part, at 212°. Insoluble in alcohol.

Medical Use.—*Internally*, emetic, in doses of from 2 to 30 grains; astringent or tonic in doses of from 1 to 2 grains twice a day. *Externally*, astringent, as a collyrium or lotion, in doses of from 12 to 20 grains, in 8 oz. of water.

Symptoms.—*Primary*—Sour taste in the mouth; nausea and continued vomiting; severe pains in the stomach and intestines. *Secondary*—Diarrhæa; respiration difficult; pain in the abdomen increased; anxiety; paleness of the features; trembling; coldness of the extremities; death.

Remedies.—The sulphate of zinc is acted upon in precisely the same manner as the sulphate of copper, by albumen, gluten, and milk; of course, these articles must be given plentifully; injections of mutton broth; warm milk and water, or any other bland fluid, may be administered if necessary, as also must bleeding, and the usual antiphlogistic remedies. *Rationale*—The albumen and gluten decompose the salt, and the metallic oxide forms an insoluble compound with the

animal matter; the milk has also partially the same effect. The use of injections and the lancet are obvious.

Morbid Appearances.—Patches of inflammation in the mucous membrane of the stomach and intestines; black extravasated blood may also be found on their muscular coats; increased signs of vascularity throughout the whole intestinal canal.

Cause of Death.—When death occurs from the action of the poison, it is owing to want of power in the stomach, that organ being in such a debilitated state as not to discharge the whole mass; hence a sufficient quantity is left behind to occasion inflammation and gangrene of the mucous coats of the stomach and intestines.

Tests.—Collect and filter the contents of the stomach; drop a little oxalic acid into the fluid, when, if sulph. zinci is present, a white precipitate will be thrown down, which is the oxalate of zinc. The addition of the arseniates of soda or potass, produces white precipitate, the arseniate of zinc, which is insoluble in water. The chromate of potass precipitates from the solution an orange-yellow powder, the chromate of zinc. The ferro-cyanate of potass throws down a white precipitate, as does also a stream of sulphuretted hydrogen.

TARTRAS ANTIMONY. TARTAR EMETIC.

Character and Composition.—Pure tartar emetic is in colourless and transparent triedral pyrimidical crystals by exposure to the air it effloresces, when it assumes the form of a yellowish white powder: taste, slightly caustic, nauseous, and metallic: odour, none.

Composition.—The composition of this salt according to M. Thenard, is,

Acid,	35.4
Oxide,	39.6
Potass,	16.7
Water,	8.3=100

If we adopt the views of Gay Lussac, this salt may be a compound of a prime equivalent of tartar—23.825, with a prime equivalent of deutoxide of antimony—13. On this hypothesis we would have the following proportions:

2 Primes Acid,	16.75	45.4
1 do. Potass,	5.95	16.2
1 do. Water,	1.125	3.1
1 Oxide of Antimony,	13.00	35.3
	36.825	100.0

But very little confidence can be placed in such atomical representations. Specific gravity, 2.100. Solubility, in 15 times its weight of water, at 60°; and three times its weight at 212°.

Medical Use and Dose.—Internally, it is given as an emetic, in doses of from 2 to 4 grains; it is also a diaphoretic, and expectorant in doses of from $\frac{1}{10}$ to $\frac{1}{2}$ of a grain, either in solution or as a troche. *Externally*, a rubefacient, for which 3 drachms may be rubbed up with prepared lard into an ointment

Symptoms.—Primary—Nausea, and severe sickness, hiccough; acute pain and sense of heat in the epigastric region; pulse small, frequent and hard. *Secondary*—Sense of tightness in the throat; increased pain in the abdomen; oppressed respiration; syncope; cramps; insensibility to stimulants; vertigo; convulsions; death.

Remedies.—Copious draughts of decoction of yellow bark, in which a little alum may be dissolved; if the poison is well

evacuated, a solution of opium in any bland fluid may be given; infusion of rhubarb will also prove serviceable. *Rationale*—The water or bland fluids encourage the vomiting produced by the poison, and perhaps enable the stomach to evacuate the whole; the opium will allay the vomiting, but ought not to be given whilst any of the poison remains in the stomach, as it will then exercise its irritating properties, uncontrolled, upon the internal viscera; it may, however, be administered after the poison has been evacuated, when its sedative properties will allay the excessive irritation of the stomach after its previous excitement. One ounce of the decoction of bark is capable of decomposing and rendering inert a scruple of the tart. antim. The utility of its exhibition is therefore sufficiently obvious. A solution of alum, or any salt containing an excess of acid, throws down a white insoluble and inert precipitate, which is the sulphate of antimony. The infusion of rhubarb also decomposes it and renders it inert.

Morbid Appearances.—Inflammation of the mucous membrane of the stomach; the stomach and intestines inflated with gas; peritoneum of a dark, dirty red colour; the membranes of the brain in a state of extreme vascularity, and generally effusion into the ventricles. Majendie found the lungs of an orange-red or violet colour throughout, destitute of crepitation, gorged with blood, dense like the spleen, and here and there even hepatized.

Cause of Death.—The brain, heart, and alimentary canal, are affected through the medium of the circulation; it generally attacks the heart, and produces death by syncope; sometimes the brain is peculiarly subjected to the action of the poison; death, in such cases, is produced by inflammatory excitement and effusion; death may also be produced by the inflammatory state of the intestinal canal; not so much from

the corrosive nature of the poison, as from the excitement of the circulatory system, determined to the abdominal viscera.

Tests.—Collect what quantity of the poison can be found in the stomach, submit it to heat in a closed tube, as directed in tests for hydr. oxymur. The odour of burnt vegetable matter will be perceived, and the powder at first blackening, will soon display the metallic antimony on the sides of the tube. If no portion of the powder can be discovered, carefully collect the fluid contained in the stomach, and after straining it, add a few drops of the tincture of galls, and if the tart. antim. is present, a dirty white precipitate inclining to a yellow colour will be thrown down. If the vinous solution of antimony has been taken, the same test will give the precipitate a bright violet colour. If the poison has been taken in tea, the addition of hydro-sulphuret of ammonia will give a red coloured precipitate. A solution of alum affords a white precipitate Muriatic and sulphuric acids throw down a white precipitate, and take it up again, if added in excess. The best test is sulphuretted hydrogen, in a solution containing only an eighth part of a grain per ounce, which gives it an orange red colour ; when the excess of gas is expelled by heat, it becomes an orange red precipitate ; and if the proportion of the salt is greater, the precipitate is thrown down at once.

ARSENICUM ALBUM SUBLIMATUM. SUBLIMED OXYD OF ARSENIC. ACIDUM ARSENIOSUM. ARSENOUS ACID. WHITE ARSENIC.

Character and Composition.—White, semi-vitreous and brittle lumps: when in powder, it resembles white sugar. Taste, little or none, or if any, faintly sweet : inodorous.

Composition.—

Arsenic,	75.2
Oxygen,	24.8=100

Specific gravity, 3.729. Soluble in 400 parts of water, at 60° and 13 parts at 212° : it is sublimed at 380° F.

Medical Use and Dose.—Internally, tonic and alterative; dose from $\frac{1}{16}$ to $\frac{1}{4}$ of a grain in pill. The usual method of employing it is in solution, (the liquor arsenicalis or Fowler's solution,) of which from four to seven drops may be given, gradually increasing the dose to twenty or twenty-five. *Externally*, in an ointment made of arsenic, one drachm, prepared lard twelve drachms; or in solution as a lotion, as liquor arsenicalis, two drachms, aqua fontana, six ounces; or arsenic in powder four grains, water six ounces. In any of the above forms, arsenic is sometimes applied to cancerous ulcers.

Symptoms.—Primary—Acrid metallic taste; constant spitting; difficulty of swallowing; nausea; vomiting of a brown matter sometimes mixed with blood; excessive thirst; great heat in the stomach and throat, with severe pain in the former. *Secondary*—All the above symptoms greatly aggravated; fainting; diarrhœa and tenesmus; the discharges from the intestines of a greenish black colour, and very offensive; pulse, small, frequent and intermittent; palpitation of the heart; copious perspiration; itching on the surface of the body; swelling of the abdomen, and an apearance of livid spots; great prostration of strength: paralysis of the feet and hands; delirium; convulsions; death.

Remedies.—The stomach pump, or the most active emetics must be immediately employed; large draughts of milk, chalk and water; lime water; or any mucilaginous fluid may be given. The inflammation must be subdued by fomentations, emollient enemas, and the tepid bath. The lancet must be abstained from as long as any of the poison remains in the stomach, as venesection will promote its absorption, it may however be resorted to with success after the poison is removed.

Rationale.—Any mucilaginous fluid will promote the evacuation of the contents of the stomach, but the stomach pump if it can be obtained will be the most certain remedy; the solution of chalk, or the carbonate of lime, or lime water, will not only assist in the same effect, but will decompose the arsenous acid, forming an arsenate of lime, which is insoluble and inert. All the alkaline solutions and magnesia, accelerate the fatal effects of the poison by promoting its absorption.

Morbid Appearances.—The stomach and intestines sometimes exhibit marks of intense inflammation, and at others so slight an appearance as to deceive an inexperienced observer; in frequent cases an erosion of the villous coat of the stomach is observed, on the surface of which, small portions of the arsenic may be detected; the duodenum, jejunum and ilium partake in this inconsistency of appearance; at one time appearing but little affected, and at another in the highest state of vascularity or even gangrene; the lungs are often black and gorged with blood; the membranes of the brain highly vascular and thickened, with a considerable portion of fluid on the ventricles, and the vessels extremely turgid. To the stomach and intestines, however, the attention must be chiefly directed, although the mischief may appear to be trifling. In such cases the poison has been absorbed too rapidly into the system to produce its corrosive effects upon their mucous membranes; death has followed the blow inflicted upon the circulatory system at large, too quickly to permit the virulence of the poison to work its full effect upon any particular organs.

Cause of Death.—Arsenic acts through the circulation upon the vital organs, the heart, brain, or the intestinal canal; death generally results too quickly after the exhibition of the poison, to be regarded as the positive result of inflammation. The arsenous acid has a capability of acting either as an external or internal agent, as administered into the stomach or into the system by a wound.

Tests.—Tie a ligature round the cardiac and pyloric orifices of the stomach, and remove this organ from the body. Collect and strain its contents, and if arsenic is present, it will be found in the form of a white powder, which should be boiled in a few ounces of distilled water, in a Florence flask, and exposed to the following tests: 1. Mix a portion of the powder with three times its weight of black flux, and insert it into a glass tube; expose it to heat as directed in test No. 2, and the arsenic, if present, will coat the tube with a shining metallic crust, which collected and laid on heated iron or charcoal, will exhale in dense fumes with a strong odour of garlic. 2. To some of the above solution of arsenic in the Florence flask, add while it is boiling 2 or 3 grains of the subcarbonate of potass, agitating the mixture; then present to the surface of the solution, a stick of nitrate of silver, and if arsenic is present, a beautiful yellow precipitate will instantly proceed from the point of contact, and settle towards the bottom as a flocculent and copious powder; this test will detect the 60th part of a grain of arsenic in two ounces of water. 3. To the same solution of arsenic as above add the same quantity of subcarbonate of potass, and then a few drops of the solution of the sulphate of copper, when a grass green precipitate will ensue, which is an arsenite of copper, well known as the pigment called Scheele's green. If arsenic is not present during the trial of this test, the precipitate will be a delicate sky blue. 4. A stream of sulphuretted hydrogen gas is the most delicate test of the presence of arsenic, producing a beautiful golden coloured precipitate. 5. Into the suspected solution, stir a moderate quantity of charcoal powder, allow it to settle, then pour off the liquid, and when the powder is dry, sprinkle it on a red-hot iron, when, if any arsenic is present, it will exhale in white fumes, giving a strong smell of garlic. 6. Drop some of the suspected solution on a piece of white paper, making a broad line, along which draw

a stick of lunar caustic, and brush the streak over with liquid ammonia ; if arsenic is present, a bright yellow is produced, which will retain its colour for nearly an hour.

EARTHS.

MURIAS BARYTÆ. MURIATE OF BARYTES.

Character and Composition.—Colourless tabular crystals : taste, bitter and disagreeable : inodorous.

Composition.—

Muriatic acid,	23.35
Baryta,	61.85
Water,	14.80=100

Soluble in three times its weight of water at 60°.

Medical Use.—Internally, sudorific and alterative ; dose from 10 to 20 drops of the saturated solution in distilled water. *Externally,* in diseases of the skin, and scrofulous ulcers, the same solution may be applied as a lotion.

Symptoms.—Primary—Violent vomiting ; violent heat, and excruciating pains in the stomach and bowels ; excessive diarrhœa. *Secondary*—Vertigo ; stupor ; paralysis of the extremities ; convulsions ; death.

Remedies.—Plentiful draughts of any bland fluid ; solutions of the sulphates of soda or magnesia ; the fauces must be irritated in order to excite vomiting. *Rationale*—The bland fluids are exhibited to protect as much as possible the stomach and intestines ; the solutions of the sulph. soda or magnesia, are chiefly to be relied upon as decomposing the muriate, and converting it into an insoluble and inert sulphate

of barytes; a weak solution of sulph. acid may produce the same effect more rapidly.

Morbid Appearances.—In general, the mucous membrane of the stomach is in a state of great inflammation; increased vascularity of the membranes of the brain, and the vessels of that organ turgid.

Cause of Death.—This poison acts through the circulation upon the vital organs, as the heart, (producing fatal syncope,) the brain, (causing convulsions,) or the intestinal canal; its corrosive properties would be sufficient to occasion death by gangrene, were the circulation not even primarily affected.

Tests.—Collect and filter the contents of the stomach, and then submit it to the following tests: 1. To the suspected solution add a little sulph. acid, when, if the muriate of barytes is present, a white powder will be precipitated, which is insoluble in nitric acid. 2. Add a few grains of argenti nitras, when a curdled white precipitate is the result, which is insoluble in water and nitric acid. Should the poison have been taken in wine, coffee, or any coloured fluid, the addition of a little chlorine will destroy the colour. The excess of chlorine must be dissipated by heat, before the nitrate of silver is employed as a test.

CALX. LIME.

Character and Composition.—Solid masses of a white colour, easily pulverized: taste, acrid and alkaline: inodorous.

Composition.—

Calcium (or the metallic base of lime) one atom,	25
Oxygen, one atom,	10
Prime equivalent,	35

Specific gravity, 2.3. Water dissolves the 450th part.

Medical Use.—Internally, the liquor calcis is given as an astringent, tonic, and anti-acid; it is also frequently given with success as a solvent in cases of stone in the bladder. *Externally,* as a detergent. *Dose*—of the liquor calcis, from two ounces to half a pint may be taken twice a day. It is employed externally in the composition of the lotio hydr. flava and nigra; also in the linimentum calcis.

Symptoms.—Primary—Nausea and vomiting; heat of the fauces and tonsils, with constriction of the æsophagus. *Secondary*—Colic, and severe pains in the stomach and bowels, the usual symptoms attendant upon abdominal inflammation.

Remedies.—Vegetable acids, as lemon juice, vinegar, &c., should be exhibited in considerable quantities as antidotes to this poison; bland fluids should be copiously prescribed when the vomiting has subsided. Should inflammatory symptoms occur, bleeding, fomentations, emollient injections, &c., must be employed. *Rationale*—The vegetable acids decompose the lime in the stomach; the bland fluids are intended to protect the coats of the stomach and intestines; the use of the lancet, &c. is obvious.

Morbid Appearances.—Intense inflammation of the stomach and intestines, with patches of gangrene, and the mucous membrane perforated in many places.

Cause of Death.—Inflammation and gangrene of the mucous membranes of the stomach and intestines.

Tests.—Take the suspected substance as found in the stomach and intestines; pour over it distilled water; stop the vessel closely, and after a short time filter; add a little oxalic acid, when if lime is present, it will be precipitated. A solution of lime gives a strong and styptic taste; vegetable blue colours are changed to green by an addition of the solution

of lime. If no powder is found in the alimentary canal, the whole of its contents may be calcined, and the residue treated by the above tests.

ALKALIES.

POTASS.

NITRAS POTASSÆ. SALT PETRE. SAL NITRE.

Character and Composition.—Six-sided prismatic crystals, terminating by two converging planes: taste, sharp and bitter, producing a cold sensation: inodorous.

Composition.—

Potass,	51.8
Nitric acid.	44.0
Water,	4.2=100

Specific gravity, 2.00. Soluble in seven parts of water at 60°, and in its own weight at 212°.

Medical Use.—*Internally*, refrigerant; diuretic; aperient; antiscorbutic; and as a gargle in diseases of the throat. *Dose*, as a diuretic or refrigerant, from 10 to 15 grains; as an aperient, from 25 to 40; as an antiscorbutic, from 2 scruples to 1 drachm, dissolved in one ounce of vinegar, and diluted with two or three ounces of water, (to which a little sugar may be added, to render it more palatable,) may be taken from three to eight times per day, as the urgency of the case may require; as a gargle, one drachm of nitre, dissolved in six ounces of rose-water.

Symptoms.—*Primary*—When taken in large quantities, (in mistake for glauber salts,) it produces immediate nausea and

vomiting, with severe pain in the stomach and intestines. *Secondary*—Sickness continued; diarrhœa, with discharges of blood from the stomach and bowels; impeded respiration; severe pain throughout the abdominal region; syncope; paralysis of the extremities; convulsions; death.

Remedies.—Large and repeated draughts of any bland fluid, as milk, barley water, linseed tea, common gruel, in which sweet oil or fresh butter is suspended; emollient enemas; one or two grains of opium, with aromatics, repeated every two or three hours; bleeding; leeches to the abdomen; fomentations, &c. *Rationale*—The bland fluids are intended to defend the mucous membrane of the stomach and intestinal canal, from the action of the poison; the opium and aromatics, as direct sedatives, counteract the irritability occasioned by the poison; the lancet, and other antiphlogistic measures, are indicated by the inflammatory symptoms.

Morbid Appearances.—General inflammation and gangrene of the coats of the stomach and intestines, particularly of the former; numerous perforations may be observed. *Cause of Death.*—A direct affection is produced upon the mucous coats of the stomach and intestines, by the corrosive nature of the poison, and death is occasioned by inflammation and gangrene.

Tests.—Evaporate the contents of the stomach to dryness; collect the residue, and pour upon it hot sulphuric acid, when nitrous acid fumes will be given out, if nitrate of potass is present in excess. If a portion of the dried mass is thrown upon coals the nitrate of potass will immediately deflagrate. Platina and the muriate of platina, are delicate tests of all the salts of potass, and may be applied to the detection of the nitrate, by the addition of the muriate of platina to the contents of the stomach: when it is present, an orange coloured precipitate

will be thrown down. This test is however applicable also to ammonia, and therefore becomes less valuable.

POTASSA FUSA. LAPIS INFERNALIS. CAUSTIC POTASS.

Character and Composition.—It is generally run into cylindrical moulds, of a grey colour, soapy feel, and extremely deliquiscent: taste, acrid and caustic: indorous.

Composition.—

Potassium, or the metallic base of potass,	82.3
Oxygen,	17.7=100

It is generally accompanied with small portions of silex, lime, and oxide of iron. *Solubility*, one ounce of water at 60° will dissolve seven drachms: it is also soluble in alcohol.

Medical Use.—This preparation of potass is not now used internally, but was formerly exhibited as a lithontriptic, when diluted with broths. *Externally*, it is applied either in substance, or a solution of from 10 to 15 grains to an ounce of water, as an escharotic.

Symptoms.—*Primary*—Sharp and acrid taste in the mouth; nausea; vomiting; acute pains in the stomach and bowels; with nearly the same symptoms as are occasioned by the nitrate of potass. *Secondary*—The above symptoms increased; sickness; diarrhœa; discharges of blood; severe pain in the abdomen; syncope; paralysis of the extremities; convulsions; death.

Remedies.—The same method of treatment, but more energetic, must be adopted, as is recommended under poisoning by nitrate of potass, which see.

Morbid Appearances.—Similar to those produced by the action of the nitrate of potass. *Cause of Death.*—Inflammation and gangrene of the mucous membranes of the stomach and intestines.

Tests.—Collect the contents of the stomach, or the liquor vomited, and filter it. A solution of potass will feel soapy to the touch; will change the vegetable blue and red colours to green; and throw down an immediate precipitate, from a solution of argenti nitras, in the form of a dark coloured oxide, soluble in nitric acid; evaporate a portion of the solution to dryness, and expose the mass to the air, and if potass is present, it will deliquesce, which is not the case with caustic soda, or the salts of that alkali.

AMMONIA.

Character and Composition.—Pure ammonia exists in the form of a transparent, colourless, and consequently invisible gas, possessed of elasticity, and the other mechanical properties of the atmospherical air. Its specific gravity is an important datum in chemical researches, and has been rather differently stated. Now, as no æriform body is more easily obtained in a pure state than ammonia, this diversity among accurate experimentalists, shows the nicety of this statistical operation. M. M. Biot and Arago make it = 0.59669 by experiment, and by calculation from its elementary gases, they make it = 0.59438. Kirwan says, that 100 cubic inches weigh 18.16 grains at 30 inches of bar. and 61° F., which, compared to air, reckoned 30.519, gives 0.59540. Sir H. Davy determines its density to be = 0.590, which agrees with Dr. Prout. According to Gay Lussac, the specific gravity of gaseous ammonia is = 0.5967, and of liquid, = 0.954.

Composition.—A compound of hydrogen and nitrogen, consisting of three volumes of the former, and one of the latter, condensed into two; these three volumes of hydrogen represent three atoms, = 3.75; and one of nitrogen, one atom of this substance, = 17.5.—(Reid.) One measure of water will

condense 460 times its bulk of gaseous ammonia. This gas, largely diluted, forms the liquid ammonia for medical use.

Medical Use and Dose.—Internally, stimulant and antacid, in doses of from 15 to 20 drops of liquid ammonia, largely diluted. *Externally*, rubefacient, in various proportions, as intended for a vesicatory or liniment; for the latter, the dose is one drachm to one ounce of olive oil; for the former, a much stronger dose is necessary.

Symptoms.—Primary—If a large dose has been taken, the immediate sensation is that of strangulation, which is rapidly succeeded by convulsions and death. Where the quantity has not been sufficient to produce the above effects so quickly, the mouth and fauces are excoriated, and a sense of burning prevails in the mouth, fauces, and throat, with nausea and vomiting. *Secondary*—The bowels are violently affected with severe griping pains; continued vomiting; discharges of blood both from the stomach and bowels; delirium; convulsions; death.

Remedies.—The same method of treatment must be adopted which is recommended in cases of poisoning, from nitrate of potass.

Morbid Appearances.—The œsophagus and cardiac portion of the stomach, that organ itself, and the whole of the intestinal canal, are in a state of extreme inflammation, with occasional patches of ulceration and gangrene. *Cause of Death.*—The same as from nitrate of potass.

Tests.—Liquid ammonia is easily recognized by its pungent odour, and by changing the vegetable blues and reds to a green colour. A solution of nitrate of silver is not affected in the least either in colour or by precipitate when ammonia is added. Immerse a piece of bright copper into the liquid collected, and if ammonia is present, it produces a blue colour; a diluted solution of sulphate of copper, acetate of copper, or any of its salts, produces the same effects.

SESQUI-CARBONATE OF AMMONIA. SMELLING SALTS.

There are a variety of carbonates known in chemistry, but this is the only one of any consequence. It is solid, white, fibrous, and has the same odour as pure ammonia. Its solution differs but little in physical properties from pure liquid ammonia; but unlike it, is precipitated by the salts of lime. For remedies, &c. see ammonia.

HYDROCHLORATE OF AMMONIA. SAL AMMONIAC.

It is known by its solid, white, crystaline appearance, its ductility, its volatility, and by the effects of caustic potass, and nitrate of silver; the former of which disengages an ammoniacal odour, whilst the latter causes, in a solution of the salts, a white precipitate, the chloride of silver. For remedies, &c. see ammonia.

ACIDS.

The class of acids has been distributed into three orders, according as they are derived from the mineral, the vegetable, or the animal kingdom. But a more specific distribution is now requisite. They have also been arranged into those which have a single, and those which have a compound basis or radical. But this arrangement is not only vague, but liable in other respects to considerable objections. The chief advantage of a classification is to give general views to beginners in the study, by grouping together such substances as have analogous properties or composition. These objects, it is hoped, will be tolerably well attained by the following divisions and subdivisions.

Division 1st. Acids from inorganic nature, or which are procurable without having recourse to animal or vegetable products.

Division 2d. Acids elaborated by means of organization.

The first group is subdivided into three families: 1st, Oxygen Acids; 2d, Hydrogen Acids; 3d, Acids destitute of both these supposed acidifiers.

FAMILY 1ST. OXYGEN ACIDS.

Section 1st, Non-Metallic.

1. Boracic.
2. Carbonic.
3. Chloric.
4. Perchloric.
5. Chloro-carbonic.
6. Nitrous.
7. Nitric.
8. Iodic.
9. Hypophosphorous.
10. Phosphorous
11. Phosphoric.
12. Hyposulphurous.
13. Sulphurous.
14. Sulphuric.
15. Hyposulphuric.
16. Cyanic?

Section 2d, Oxygen Acids. Metallic.

1. Arsenic.
2. Arsenious.
3. Antimonious.
4. Antimonic.
5. Chromic.
6. Columbic.
7. Molybdic.
8. Molybdous.
9. Tungstic.

FAMILY 2D. HYDROGEN ACIDS.

1. Fluoric.
2. Hydriodic.
3. Hydrochloric.
4. Ferroprussic.
5. Hydroprussic.
6. Hydrosulphurous.
7. Hydrotellurous.
8. Sulphuroprussic.

FAMILY 3d. ACIDS WITHOUT OXYGEN OR HYDROGEN.

1. Chloriodic.
2. Chloroprussic.
3. Fluoboric.
4. Fluosilicic.

Division 2d. Acids of Organic Origin.

1. Aceric.
2. Acetic.
3. Amniotic.
4. Benzoic.
5. Boletic.
6. Camphoric.
7. Caseic.
8. Citric.
9. Formic.
10. Fungic.
11. Gallic.
12. Kinic.
13. Laccic.
14. Lactic.
15. Lampic.
16. Lithic.
17. Malic.
18. Meconic.
19. Menispermic.
20. Margaric.
21. Melassic.
22. Mellitic.
23. Moroxylic.
24. Mucic.
25. Oleic.
26. Oxalic.
27. Purpuric.
28. Pyrolithic.
29. Pyromalic.
30. Pyrotartaric.
31. Rosacic.
32. Saclactic.
33. Sebacic.
34. Suberic.
35. Succinic.
36. Sulphovinic?
37. Tartaric.
38. Zumic.

The acids of the last division are all decomposable at a red heat, and afford generally carbon, hydrogen, oxygen, and in some few cases, also nitrogen. The mellitic is found like amber in wood coal, and like it, is undoubtedly of organic origin. Of these acids, we shall only notice those which are most important, and which are frequently used as poisonous.

ACIDUM NITRICUM. NITRIC ACID. AQUA FORTIS.

Character and Composition.—This acid, when pure, is in the form of a white limpid fluid, but it is generally found in the shops of a bright yellow colour, and emits white fumes: taste, very acid and corrosive: odour, very suffocating.

Composition.—

Nitrogen by weight,	25.97
Oxygen,	74.03=100

Specific gravity, 1.50.

Medical Use.—Internally, tonic and antiseptic in a solution of from $\frac{1}{2}$ to 1 ounce in 12 ounces of water. The fumes of the acid, when diluted, have been recently used in several cases of tubercular consumption, with apparently very good effect, but whether it will prove really useful in this disease, we must leave to time and experiments to determine; it is, however, worthy of a fair trial: it has hitherto been used by diluting 2 ounces of the acid with 6 ounces of water, and receiving the fumes into the mouth, taking the precaution to cover the head to prevent evaporation. *Externally,* it is applied in solution to ulcers as an escharotic, previously protecting the sound parts with resin ointment.

Symptoms.—Primary—When the quantity taken is small, or much diluted, a sensation of burning in the mouth, æsophagus and stomach, with excruciating pain in the abdomen, is experienced. When the quantity taken is considerable, almost immediate death is the consequence. *Secondary*—Vomiting is increased to an excessive degree; shreds of membrane, mixed with blood and mucus, are discharged from the stomach; constipation, with great agony if it is overcome, and dejections, are produced; the usual symptoms of the most intense inflammation of the abdominal viscera; pulse small and irregular; convulsions; death.

Remedies.—Copious draughts of milk or water, containing powdered chalk, magnesia, or the carbonate of potass or soda. If these articles are not at hand give soap dissolved in warm water. The inflammatory symptoms must be treated in the usual manner. *Rationale*—The solution of carbonate of lime, magnesia, potass or soda, decomposes the acid, and forms the nitrates of those alkalies by uniting with it. The use of the antiphlogistic remedies is sufficiently obvious.

Morbid Appearances.—The lips, tongue and mouth are covered with orange coloured spots; the mucous membranes of the æsophagus and stomach have on them a layer of yellow matter, and are also perforated in many places; in short the whole of the alimentary canal within the reach of the poison exhibits strongly its corroding and destructive qualities.

Cause of Death. Inflammation and gangrene of the stomach, æsophagus, and frequently of the intestines, produced by the corrosive nature of the acid.

Tests.—If the suspected fluid is boiled over copper filings, orange coloured fumes will arise, and the fluid will assume a greenish cast; but the best and most certain test, is the appearance of the body on a post mortem examination; in the orange coloured spots on the lips, tongue, and fauces, the yellow coating and corrosion of the stomach, &c. no other poison affecting these organs in a similar manner. Professor Liebig, however, has lately discovered a very characteristic and elegant test, provided the acid is not diluted with more than 400 parts of water. His test is taken from the effect of this acid on the sulphate of indigo. A solution of indigo in sulphuric acid is to be added to the suspected fluid till it communicates a perceptible blue tint, care being taken not to make the tint too dark, particularly when the suspected fluid is presumed to contain but little nitric acid. A drop of sulphuric acid is next to be added, and the mixture being put into a glass tube, heat is to be applied till it boils. As soon as it reaches the point of ebullition, the blue colour is either discharged altogether, so that a colourless liquid forms, or it gives place to a faint straw yellow tint.* The latter effect is remarked when the proportion of nitric acid is small, and the indigo tint rather deep.

* Philosophical Magazine, N. S. ii, 388.

ACIDUM SULPHURICUM. SULPHURIC ACID. OIL OF VITRIOL.

Character and Composition.—It is a colourless fluid when pure, but becomes brown when exposed to the air, or placed in contact with vegetable matter: taste, acrid and corrosive: odour, it emits white and suffocating fumes.

Composition.—

Sulphur,	30
Oxygen,	45
Water,	17
	(Davy.)

Specific gravity, 1.8452.

Medical Use.—*Internally*, tonic, stimulant. *Dose*—from 1 to 1½ ounces of the acid to 16 ounces of water, of which from 10 to 25 drops, three times a day, may be taken as a tonic; as a stimulating gargle, from 1 to 2 drachms in 8 ounces of water. *Externally*, escharotic when diluted; rubefacient used in an ointment, made by mixing from 1 to 2 drachms in 2 ounces of any simple ointment.

Symptoms.—*Primary*—Sharp and corrosive taste in the mouth; sensation of heat in the throat and fauces; vomiting; extreme pain in the œsophagus and stomach; breath fœtid. *Secondary*—Continued vomiting of frothy matter, with blood; croupy cough; difficult respiration; symptoms of severe inflammation in the stomach and intestines; pulse small and irregular; convulsions; death.

Remedies.—The general treatment must be the same as is prescribed under remedies for nitric acid, which see.

Morbid Appearances.—The coats of the stomach are black, ulcerated and severely corroded; the stomach distended with gas, and containing a quantity of dark bloody matter; the mouth of the æsophagus and the whole of the alimentary canal, as far the poison has extended, present visible effects of its corrosive action.

Cause of Death.—Inflammation and gangrene of the stomach, æsophagus, and frequently of the intestines, produced by the corrosive nature of the acid.

Tests.—1. If any quantity of the acid can be collected, it may be recognized by its specific weight, and by its evolving heat when mixed with water. 2. Add chalk to the fluid containing the sulphuric acid, and it will occasion a copious precipitate, which, after washing, boil in distilled water; to the clear solution add some barytic water, when a sulphate of barytes, in the form of a white powder, will be found, which is insoluble in nitric acid. 3. If the contents of the stomach are boiled with crude mercury, and sulphuric acid is present, sulphuric acid gas will be rapidly produced.

ACIDUM MURIATICUM. MURIATIC ACID. SPIRIT OF SALTS.

Character and Composition.—An amber coloured liquid: taste, very acid and caustic: odour, pungent and suffocating.

Composition.—A solution of muriatic acid gas in water, containing 32.32 per cent. of the gas.—(Davy.)

Specific gravity, 1.16.

Medical Use.—*Internally*, tonic and antiseptic. *Dose*—from 15 to 30 drops, diluted with 2 or 3 ounces of water. *Externally*, it is sometimes used in union with the nitric acid to form an acidulated bath, as a substitute for the use of mercury in hepatic diseases. It is also used as a stimulating gargle, in doses of 1 drachm of the acid diluted with 6 ounces of water.

Symptoms.—*Primary*—A burning sensation in the mouth and throat, with an astringent and acid taste; excessive thirst; lips black; vomiting. *Secondary*—Eyes red and inflamed; skin hot and dry; pulse hard and frequent; vomiting of bloody mucus; cold sweats; severe pains in the stomach and bowels; delirium; death.

Remedies.—Vide nitric acid.

Morbid Appearances.—The mouth, æsophagus and stomach of a deep red colour, with excessive marks of inflammation; the mucous coats of the alimentary canal exhibit patches of extravasated blood, and perforations sometimes penetrating through the entire substance of the viscera.

Cause of Death.—The same as produced by the two previous acids.

Tests.—Collect the fluid found in the stomach, and after straining, dip into it a glass rod moistened with ammonia, when if muriatic acid is present, muriate of ammonia in the form of dense white fumes will be evolved. If taken in or mixed with any coloured fluid, the acid may be detected by distilling the fluid from a retort, into a vessel, containing nitrate of silver, when the muriate of silver will be precipitated, which is recognizable by its insolubility in nitric acid and solubility in ammonia. If the contents of the stomach are boiled for an hour in a diluted solution of potass, the fluid filtered and nitrate of silver added, if any of the acid is present, a precipitate is formed which is the muriate of silver.

PHOSPHOROUS.

Character and Composition.—If perfectly pure, it is colourless and transparent, but it has generally a yellow and semi-transparent appearance, arising from the presence of carbonaceous matter: it is usually run into moulds, is soft and cohesive: its taste it hot and caustic, with a flavour resembling garlic: odour, faint and slightly oppressive when exposed to the air.

Composition.—It is a simple substance, never found pure in nature, being always united to oxygen, or in the state of phosphoric acid.—(Hooper.)

Specific gravity, 1.77: it melts at 100, burns at 148°, with a splendid white light, and a copious dense smoke, and boils at 550. It is insoluble in water, but soluble in fixed and volatile oils, ether and alcohol.

Medical.—It is sometimes given in malignant, catarrhal and typhoid fevers, as a stimulant in a state of collapse, or as stimulant in cases where the stomach is attacked by gout. The dose varies from $\frac{1}{6}$ of a grain to 2 grains. It is however a doubtful remedy, and accompanied with considerable risk in its exhibition.

Symptoms.—*Primary*—An over-dose of this substance rapidly produces its fatal effects, and if given in a large quantity, life would be instantly destroyed ; but when the quantity taken has not been sufficient to produce death so rapidly, the symptoms are, hot taste in the mouth and throat, and excruciating pains in the stomach. *Secondary*—The violent action of phosphorous upon the whole system, (but the arterial in particular,) rapidly produces the most dreadful convulsions, which soon terminate in death.

Remedies.—Immediate and copious draughts of water or any mild fluid. The best antidote that can be had is magnesia or soda, dissolved in water, and given in considerable quantities. When time can be obtained, the inflammatory symptoms must be combatted by the usual antiphlogistic remedies. *Rationale*—In filling the stomach with mild fluids, the combustion of the phosphorous is impeded, and vomiting is excited ; magnesia and soda tend to neutralize the poison, the union of the phosphoric acid with their bases forming neutral salts.

Morbid Appearances.—The stomach and intestines exhibit the usual inflammatory appearances in an intense degree; the mucous coats have numerous perforated and gangrenous patches, and are often found in a high degree of sphacelation ;

the membranes of the brain are extremely vascular, and the vessels turgid with blood.

Cause of Death.—The inflammation and gangrene of the stomach and intestines is produced by the corrosive action of the poison upon their coats ; the circulation is also affected by its absorption, giving rise to the violent symptoms described.

Tests.—The combustible properties of any portion of the poison which may be discovered, the violent effects produced upon every part of the system to which it has extended, and the peculiar alliaceous smell of the contents of the stomach, or the evacuations, are perhaps the best, and only tests, that can be relied upon.

ACIDUM OXALICUM. OXALIC ACID.

Character and Composition.—This acid crystalizes in quadrilateral prisms, the sides of which are alternately broad and narrow, and summits diedral, or, if crystallized rapidly, in small irregular needles : taste, acid and perfectly unlike the bitter taste of sulph. magnesia, for which it has frequently been mistaken : odour, none.

Composition.—

Carbon, 2 atoms,	1.5
Oxygen, 3 atoms,	3.0=4.5

It is soluble in one part of hot, and two of cold water ; 100 parts of alcohol take up near 56 of the acid at boiling heat, but not above 40 cold ; it is decomposable by a red heat, leaving a small quantity of coaly residuum.

Medical Use.—This acid is not used at all in medicine, but owing to its existence in most vegetable and animal substances, and its combination with a number of other articles in the materia medica, it is used extensively in chemistry.

Symptoms.—Primary—Oxalic acid acts as a violent poison in doses of from 2 to 3 drachms, and has frequently been given in mistake for Epsom salts; when such is the case the patient experiences a strong acid taste in the mouth; great nausea, with frequent and ineffectual attempts to vomit. *Secondary*—Burning and acute pain in the epigastric region; pulse hard and frequent; pupils dilated; severe pains in the head; delirium; convulsions; death.

Remedies—The solutions of the carbonates of lime, or magnesia in water, must be copiously administered; the bi-carbonates of potass or soda may also be given; vomiting must be promoted for a considerable time after the effects of the poison appear to have diminished, by the use of warm water and irritating the fauces. Inflammation must be treated as usual. *Rationale*—The lime, magnesia, soda and potass, neutralize the acid contained in the stomach, and form the oxalates of those bodies, by the combination of the acid with their bases, all of which are uninjurious and soluble with difficulty.

Morbid Appearances.—A viscid bright coloured mucus is found on the tongue and fauces; in some instances a portion of the stomach is altered in its consistence, and converted into a pulpy mass. The general appearances are very similar, but less in degree, than those occasioned by the mineral acids. The cause of death appears to be inflammation and gangrene of the stomach and intestines, produced by the corrosive nature of the poison.

Tests.—Collect and filter the contents of the stomach, when if oxalic acid is present, the addition of lime water will throw down a white precipitate which is the oxalate of lime. The addition of the solutions of magnesia, soda, potass and other alkalies to the contents of the stomach, will throw down pre-

cipitates which are the oxalates of those bodies. Another, though not so certain a test as the two former, may be had by the addition of alumina to the suspected fluid, and if oxalic acid is present, it will give on evaporation, a yellowish transparent mass, sweet, slightly astringent and deliquescent; which will redden litmus paper, but not the syrup of violets. When oxalic acid is dissolved in 3600 times its weight of water, the solution reddens litmus paper, and is perceptibly acid to the taste.

HYDRO-CYANIC ACID. PRUSSIC ACID.

Character and Composition.—This acid is a colourless and transparent fluid, which has a strong tendency to assume the gaseous form: its taste is at first sweetish, then acrid, hot, and virulent, and excites coughing: odour, similar to that of peach blossoms, or bitter almonds.

Composition.—

Cyanogen, one atom,	32.55
Hydrogen,	1.25

Specific gravity, at $44\frac{1}{2}°$, 0.7058; at 64°, it is 0.6969; it boils at $81\frac{1}{2}$, and congeals at about 3°.

Medical Use.—Internally, sedative and antispasmodic. *Dose*—Scheele's preparation, containing one part of the acid and six of water, is generally used, of which from four to six drops may be taken twice a day. *Externally*, it is sometimes applied in impetiginous affections, in a solution of 1 drachm of the diluted acid, as above, added to $1\frac{1}{2}$ ounces of rose water. This acid becomes inert from age or exposure to the atmosphere, and to insure its effects ought to be made immediately before using.

Symptoms.—Primary—When the acid has its usual strength a dose of from 15 to 20 drops produces immediate death; but

when a sufficient quantity has not been taken, or the acid is not sufficiently vigorous to produce such rapid effects, stupor and weight in the head, nausea, fainting, obscurity of vision, and slight difficulty of respiration, are the primary symptoms. *Secondary*—Violent vomiting of a dark coloured and bloody matter; vertigo; pupils dilated; respiration difficult; pulse small and irregular; cold and clammy sweats; fainting; prostration of strength; death.

Remedies.—The stomach pump must be put in immediate requisition; in its absence give an emetic of from 20 to 30 grains of sulphate of zinc, or 10 to 15 grains of sulphate of copper, in an ounce of water, but all attempts to dilute the poison or to excite vomiting by the use of liquids must be abstained from, and even during the operation of the emetic no fluid must be given, as by such measures the absorption of the poison would be promoted. If the emetic cannot be easily obtained, or after its operation, if thought necessary, chalk or magnesia may be exhibited in as little water as possible. Chlorine is said to be an antidote, but has not yet been sufficiently tested to be positively depended upon; it is however worthy of a fair trial. After the poison has been evacuated or decomposed as above, the most active stimulants must be resorted to, as hot brandy and water, camphor mixture, with liquid ammonia, aromatic spirit of ammonia, oil of turpentine, &c. No time should be lost in resorting to the above method of treatment, especially the exhibition of the stimulants, as the sedative and depressing effects of the poison upon the system are extremely rapid. *Rationale*—The use of the emetics and the stomach pump is obvious. The chalk and magnesia combine with the acid and form the hydrocyanites, or prussiates of lime, or magnesia, which are insoluble, and may be evacuated by suitable injections; or if the case will admit by mild cathartics; the castor oil will perhaps be best. If the chlorine is actu-

ally of any value as an antidote to this poison, it undoubtedly acts by chemical decomposition, but it is still doubted by some.*

Morbid Appearances.—If the examination takes place very soon after death, a strong odour, resembling that of bitter almonds, is perceptible in every part of the body; but no effects of the poison can be detected, with any degree of certainty, either in the brain, heart or abdominal viscera.

Cause of Death.—This acid exerts its powerful and deadly influence by its action upon the nervous system, and is too rapid in its operation to permit any consequences to extend to the circulatory or respiratory organs.—(Orfila.)

Tests.—A white precipitate will be afforded from the nitrates of silver and mercury, if a small portion of the contents of the stomach, containing prussic acid, is mixed with them; but the difficulty of collecting the acid, almost prohibits the use of these tests. The blood found in the ventricles of the heart, and the fluid collected in the ventricles of the brain, or in the stomach, may be agitated with distilled water, and then filtered; a few drops of the solution of sulphate of iron should now be added, and if the acid is present, a dark brown precipitate will be the result, which, by the addition of a few drops of sulphuric acid, instantly turns to a bluish green, and gradually deepens to a full blue colour. To the liquid collected from the ventricles or stomach, as above, add a small quantity of potass, then a few drops of a solution of the sulphate of copper, and afterwards a small quantity of muriatic acid to dissolve the excess of the oxide of copper; the liquid will then appear more or less milky, according to the quantity of prussic acid present. This is an extremely delicate test,

* I have not yet been able to make a sufficient number of experiments to enable me to say whether it may be relied upon as a certain remedy or not; but those which I have made speak strongly in its favour.

and is capable of detecting the $\frac{1}{20000}$ part of the acid in water. —(Lassaigne.)

CHLORINE.

Chlorine, in its gaseous state, acts powerfully as an irritant on the windpipe and lungs; and in solution, it retains to a considerable extent its poisonous qualities. Orfila says,* five ounces of a strong solution of chlorine will kill a dog in twenty-four hours, if kept in the stomach by a ligature; and two ounces, if diluted with twice its volume of water, proves fatal in four days; that the symptoms are those of irritation of the stomach; and that he found in the former case general redness and blackness, in the latter ulceration of its villous coat.

VEGETABLE

STIMULANTS, NARCOTICS, CATHARTICS AND IRRITANTS.

PAPAVER SOMNIFERUM. OPIUM. TR. OPII. LAUDANUM.

Class,	Polyandria.
Order,	Monogynia.
Plant,	An annual.

Character and Composition.—Opium is the concreted milky juice of the white poppy; (the best is imported from Turkey); it has also recently been extracted from the common garden lettuce. It is imported in the form of flattened masses of a compact texture, is opaque, plastic, and of a reddish brown colour: taste, nauseously bitter: odour, heavy and narcotic.

Composition.—Bitter extractive matter, (morphia,) gum, resin, an alkaline principle on which the medicinal and soporific qualities of the drug greatly depend, sulphate of lime, glu-

* Toxicologie Générale, i, 141.

ten, a fixed oil, a peculiar acid, (discovered by Robiquet,) feculent matter, vegetable fibre, and a peculiar saline body to which the name of narcotine has been given. This is supposed by Majendie to occasion the peculiar after-effects of this drug. *Solubility.*—It is partially soluble in water, wine, and alcohol; but acetic acid is its best and most powerful solvent.

Specific gravity, 1.336.

Medical Use.—*Internally*, stimulant in small doses of half a grain in substance, or 12 to 120 drops in the tincture; sedative and narcotic, in doses of from one to four grains of the substance or from 30 to 60 drops of the tincture.—*Externally*, its primary action is stimulant, but is soon succeeded by its sedative effects; it is frequently applied to inflamed or irritated surfaces; in a watery solution of one drachm to an ounce of water, either alone or combined with acetas plumbi.

Symptoms.—*Primary*—Drowsiness and stupor; insensibility to stimuli; countenance pale and contracted; frequent sighing. *Secondary*—The above symptoms aggravated; low muttering; delirium; pulse feeble and irregular; stertorious breathing; cold and clammy sweats; twitching of the muscles; convulsions; death.

Remedies.—An emetic of from 20 to 30 grains sulphas zinci, or 6 grains of sulphas cupri; if these are not at hand 3 or 4 grains of tartarized antimony, or 30 grains ipecac. must be dissolved in warm water and given as soon as possible. The throat must be irritated, and the stomach excited to vomiting by copious draughts of warm water; vinegar and water, or lemon juice may be given; stimulants, as strong coffee, spirit and water, or a solution of carbonate of ammonia must also be administered; and the most active measures must be

resorted to in order to arouse the patient into consciousness, by walking quickly about the apartment, and the application of the oil of turpentine and other irritants to the surface of the body; but the most valuable remedy for this purpose is the use of the cold bath, which if freely resorted to will in the worst cases of stupor, produce almost instantaneously a favourable effect; the shower bath, or in its absence throwing the water with considerable violence upon the patient's whole body, will be the best method of applying it. The student will remember that no temporizing can possibly be allowed in cases of poisoning by opium; but the most energetic remedies must be promptly and perseveringly exhibited. *Rationale*—The use of the emetics is obvious, but in some cases the natural energy of the stomach is so completely overcome, that vomiting cannot be produced; in such cases, if the stomach pump cannot be obtained, a powerful cathartic might be given with advantage, with a view of carrying the poison downwards; but our chief dependence must be placed on the cold bath, the external and internal stimulants, for the purpose of counteracting the sedative effects of the poison. The exhibition of the vegetable acids, when the stomach has been previously evacuated, lessens the stupor occasioned by the opium, but if administered before the poison has been removed, they are highly improper as favouring its rapid solution and consequent absorption.

Morbid Appearances—Turgescence of the vessels of the brain, and watery effusion into the ventricles, and on the surface of the brain, are generally met with, and in some cases exist to a considerable extent; but congestion and effusion are by no means universal. The lungs are sometimes found gorged with blood, as in many cases of apoplexy, but this appearance is not more constant than congestion in the brain; redness and inflammation of the stomach sometimes, (though

but seldom,) occur. Lividity of the skin, and fluidity of the blood are almost always present, and the body frequently passes rapidly into a state of putrefaction.

Cause of Death.—The exact mode in which death is produced by opium is still a matter of dispute; it however probably acts in two ways: first, through the medium of the nerves, by rapidly diminishing the sensorial energy, in which case death would be produced by suffocation from a paralysis of the respiratory muscles; secondly, by absorption through the medium of the circulation, when it would destroy life by inducing apoplexy, when determined to the brain, and paralysis and syncope, when determined or extended to the heart.

Tests.—Collect the contents of the stomach, add liquid ammonia, when if opium is present, a small precipitate will be thrown down which is morphia; if the opium has been taken in porter as is frequently the case, this precipitate will be accompanied with a grayish brown powder of considerable bulk, insoluble in water and alcohol, but readily soluble in nitric acid; this is probably some form of hordein, and may be separated from the alkaline principle of the opium by boiling alcohol; when the alcoholic solution has evaporated, a minute pelicle of morphia will be found on the capsule, which if touched with a drop of nitric acid of the specific gravity of 1.3, will assume the characteristic blood red tint, and acquire the peculiarly bitter taste of morphia.—(Ure.) The most certain test is probably the strong narcotic odour of the stomach, if early examination can be obtained.

ATROPA BELLA-DONNA. BELLA-DONNA FOLIÆ. DEADLY NIGHT-SHADE.

Class,	Pentandria.
Order,	Monogynia.
Plant,	Perennial.

Character and Composition.—Every part of this plant is poisonous, but the leaves and root are the most powerful: the flower is small and of a purple colour, approaching to black: taste, nauseous sweetness, with a slight degree of acidity: inodourous.

Composition.—The leaves in particular contain a substance analagous to albumen, salts with a base of potass, and a bitter principle.—(Vauquelin.) A vegetable alkali has been detected in the bella-donna, on which its poisonous qualities depend, termed atrophia.—(Brande.) The active matter of the bella-donna can be most easily and powerfully extracted by water.

Medical Use.—Internally, sedative; narcotic; diaphoretic. *Dose*—of the extract, 1 grain gradually increased to 4 grains per day; of the infusion, made by adding 1 scruple of the leaves to 10 ounces of water; from one to two ounces may be given daily. *Externally*, the extract is rubbed on the eye in neuralgia and in irrites, for the purpose of dilating the pupils; the powdered leaves are sometimes sprinkled over cancerous sores, or applied as a poultice.

Symptoms.—Primary—A sense of dryness; constriction of the æsophagus, with great difficulty in swallowing; nausea and sickness; vertigo; pupils dilated; dimness of sight. *Secondary*—Delirium; redness and tumefaction of the face; violent pains in the head, particularly over the orbits; inflammation of the throat; sometimes a deep red colour pervades the surface of the whole body; convulsions; death.

Remedies.—The emetics recommended in cases of poisoning from opium must be immediately exhibited, although the stomach is frequently so early and so severely affected as to render them useless; in such cases give large doses of vinegar and water, lemon juice, or the vegetable acids, after which

the emetics that were previously inert will sometimes act vigorously; give active cathartics, and enemata, and subdue the inflammatory symptoms as they arise by the usual antiphlogistic remedies, taking care however that the stomach has been previously and freely evacuated, as otherwise venesection will prove one of the most powerful means of exciting absorption.—(Paris.) *Rationale*—Vide opium.

Morbid Appearances.—The body is generally greatly swelled, and putrefaction rapidly follows decease; the vessels of the brain are turgid with blood, and the membranes in a state of excessive vascularity; the stomach and intestines are highly inflamed, but the muscular coat does not appear corroded.

Cause of Death.—This poison operates upon the system in a three-fold manner. First: It is evidently absorbed, carried into the circulation, and is thus enabled to act on the brain. Secondly: It exerts a local action on the stomach and intestines, although much inferior in severity to that produced by the mineral poisons. Thirdly: It acts directly through the medium of the nerves; this is obvious from its influence upon the pupils

Tests.—As the husks and seeds of the berries are very indigestible, some of them will be found either in the stomach or ejections. No test however can be given, by which this or any of the following poisons can be detected with any degree of certainty.

DIGITALIS PURPUREA. DIGITALIS FOLIA. FOXGLOVE.

Class,	Didynamia.
Order,	Angio-spermia.
Plant,	Biennial.

Character and Composition.—Its medicinal properties chiefly reside in the leaves, which are of a lively green colour, oblong, soft, covered with hairs and serrated: the flowers are

long, pendant, and of a reddish purple colour: taste, bitter, nauseous, and slightly acrimonious: odour, scarcely perceptible.

Composition.—Extractive matter, green resin, ammoniacal salts; the active basis is termed digitalin, which possesses in an increased degree all the qualities of the plant.—(Royer.)

Medical Use.—Internally, sedative; narcotic; diuretic. *Dose*—1 grain of the powdered leaves may be given twice a day till its action becomes apparent, when it must be laid aside for some days, and again resumed; 15 to 20 drops of the tincture, or from 2 to 3 drachms of the infusion, may be given as above. *Externally,* the flowers made into an ointment with prepared lard, are frequently applied to cancers and scrofulous ulcers.

Symptoms.—Primary—Nausea; tremors; chilliness; vertigo; indistinct vision; stupor. *Secondary*—Violent sickness; cold sweats; great debilitation; hiccough,; delirium; convulsions; death.

Remedies.—The powerful emetics and cold bath, as recommended under remedies in cases of poisoning by opium; but if the poison has been already absorbed into the system, give active stimulants, as brandy and water, liquid ammonia, the aromatic confection, strong coffee, &c.; apply a blister to the region of the stomach, mustard cataplasms to the soles of the feet, or any other active stimulant. *Rationale*—The use of the stimulants and evacuents is obvious; the blister and cataplasms are intended as counter-irritants.

Morbid Appearances.—It would appear that this poison has a very slight local action, as the stomach and intestines are seldom found in a state of great vascularity. The lungs are more than usually crepitant, and the blood found in the ventricles of the heart is generally in a fluid state; but the

appearances in this, and generally in all the vegetable poisons, are more or less deceptive, consequently cannot be relied upon with certainty.

Cause of Death.—This poison acts as a direct sedative, diminishing the arterial action, and operating through the circulation upon the vital organs, as the heart or lungs.

Test.—None.

NICOTIANÆ FOLIA. NICOTIANA TABACUM. TOBACCO.

Class,	Pentandria.
Order,	Monogynia.
Plant,	Annual.

Character and Composition.—The leaves when green are of a yellowish green colour, when dry of a yellowish brown: taste, bitter, nauseous and acrid: odour, fœtid and narcotic.

Composition.—Mucilage, albumen, gluten, extractive matter, a bitter principle, an essential oil, nitrate of potass, and a proximate principle upon which the properties of the plant are supposed to depend, which is named nicotin.—(Vauquelin.) It yields an active matter both in water and alcohol.

Medical Use.—Narcotic; sedative; diuretic; emetic; cathartic. *Dose*—of the infusion, one scruple to eight ounces of boiling water for an injection; it is seldom used for any other purpose; the smoke, when introduced into the rectum, operates also as a cathartic.

Symptoms.—*Primary*, nausea; severe vomiting, and headache; nearly similar to those occasioned by the use of spirituous liquors. *Secondary*, cold and clammy sweats; prostration of strength; convulsions; death.

Remedies.—If a short time has only elapsed, use the stomach pump, or an emetic, of 2 grains of tart. antim. assisting its operation by large doses of warm water; but if some time has elapsed cathartics must be given, and afterwards lemon juice or vinegar, brandy and water, camphor, and carbonate of ammonia must be given, if the sedative effects of the tobacco render it necessary. *Rationale*—the emetic is intended to assist the nauseating effects of the poison; the sedative effects are obviated by the stimulants, and the narcotic ones by the acids.

Morbid Appearances.—The lungs are generally gorged with blood; the stomach and intestines slightly, or not at all affected; brain unaffected.

Cause of Death.—The nicotiana acts through the medium of the nervous system upon the heart, rendering it insensible to the stimulus of the blood, and producing death by syncope.—(Paris.)

Tests.—The best and only one is the peculiarly offensive odour of the ejections, or of the body upon examination.

STRYCHNUS. NUX VOMICA.

Class,	Pentandria.
Order,	Monogynia.

Character and Composition.—The medicinal qualities of the plant reside in the seed: it is of a flat, round form, about an inch broad, and a quarter of an inch in thickness, grey colour, covered with a downy substance, hard and horny within: taste, extremely bitter: inodorous.

Composition.—Gum, bitter principle, and a peculiar alkaline substance, called strychnine, which is procured in small four-sided prisms, is extremely bitter, and with the exception of prussic acid, the most powerful poison known.

Solubility.—Strychnine is readily soluble in alcohol, but takes of water 6667 parts at 50° and 2500 at 212°.

Medical Use.—Internally, it is chiefly employed by the German practitioners in mania, epilepsy, and schrofula, as a powerful narcotic. *Dose*—three or four grains of the powder during the day; of strichnine $\frac{1}{4}$ of a grain is a sufficient dose.

Symptoms.—Primary—Dizziness; stupor; wandering of the intellects; violent twitching of the extremities. *Secondary*—tetanic rigidity of the limbs; continued spasm of the muscles of the chest; extreme difficulty of respiration; all ushering in the approach of confirmed tetanus, which ends in asphyxia and death.

Remedies.—The stomach pump and emetics must be vigorously used, as in remedies for opium, after which strongly acidulated liquids, as vinegar and water, lemon juice &c. When the tetanic symptoms have commenced, calomel and opium may be given freely, but there cannot be any dependence placed on that or any other remedy. *Rationale*—The same as in other cases of poisoning from vegetable substances.

Morbid Appearances.—The stomach, intestines, lungs, and brain, appear unaffected, and present no morbid appearances. The left ventricle of the heart, has in a few cases been found gorged with blood, but this appearance is by no means general. The medulla spinalis, in this as in other cases of traumatic tetanus presents, no traces of the action of the poison, or any morbid indications.

Cause of Death.—This poison produces death by prolonged spasm of the thoraic muscles of respiration; by its rapid effects upon the medulla spinalis, without interfering with the functions of the brain.

Tests.—The contents of the stomach, or the powder if it can be separated must be boiled in water acidulated with sulphu-

ric acid; the liquid after filtration neutralized with carbonate of lime, and then evaporated to dryness. The dry mass must then be acted on by successive portions of alcohol, and evaporated to the consistence of a thin syrup. The product has an intensely bitter taste, precipitates with ammonia, becomes deep orange red with nitric acid, and will sometimes deposite crystals of strychnia on standing two or three days. These experiments it is importat to remember, because contrary to what takes place in regard to the vegitable poisons generally, nux vomica is very often found in the stomach of the patient.

VERATRUM ALBI RADIX. WHITE HELLEBORE ROOT.

Class,	Polygania.
Order,	Monœcia.

A Shrub.

Character and Composition.—This root when powdered is of a grayishbrown colour: taste, acid and nauseously bitter; inodorous.

Composition.—Wax, fecula, bitter principle, and a peculiar alkaline base called veratrine, which is the active principle of the root and soluble in water and alcohol.

Medical Use.—*Internally*, emetic and cathartic. *Dose*—from $\frac{1}{2}$ a grain to 2 grains.—*Externally*, errhine, from 2 to 3 grains, in 2 scruples of starch powder. It is also sometimes used as an ointment in herpetic eruptions and scabies, by incorporating 2 ounces of the powdered root in 8 ounces of prepared lard.

Symptoms.—*Primary*—Vomiting; excessive and bloody dijections; tremors; vertigo; pulse low and feeble. *Secondary*—Cold sweats; severe pain in the abdomen; syncope; previous symptoms aggravated; convulsions; death.

Remedies.—This poison by promoting vomiting generally proves its own remedy, but if it does not produce such an ef-

fect, an emetic must be resorted to; plentiful draughts of oily or mucilaginous fluids; vegetable acids, and stimulant mixtures, as indicated by the symptoms. Should inflammation supervene, as is frequently the case, bleeding and emollient injections must be resorted to. *Rationale*—this is sufficiently obvious in this as in all other cases of vegetable poisons.

Morbid Appearances..—The stomach and intestines are in a highly inflamed estate, but are seldom found ulcerated; the inflammation is generally the most intense in the large intestines, particularly the rectum. The vessels of the brain are gorged with blood, and its membranes highly vascular; numerous bloody spots are observed in the substance of the organ itself. The lungs are frequently affected, and found in a state of engorgement.

Cause of Death.—The manner in which this and the remainder of our vegetable poisons produce death, is by their action upon the vital organs through the medium of the circulation, and their effects would be proportionally the same were they introduced into the system by means of a wound; and proving by the quickness of their action that they are conveyed to the organs of life, by the blood, and not through the instrumentality of the lymphatic system.—(Brodie.) In the majority of cases the determination is to the brain, which upon examination is found in a state of great vascularity; and in every instance the coats of the stomach and intestines are affected, but seldom to such an extensive degree as to justify the supposition that the local action of the poison upon their membranes has been sufficient to destroy life; so that the primary effect of these vegetable poisons is upon the circulatory system, and the conquences are visible in the viscera.

Tests.—None.

HELLEBORE NIGRA RADIX. BLACK HELLEBORE ROOT.

Class,	Polyandria.
Order,	Polygania.
	A shrub.

Character and Composition.—The chief virtues of this plant reside in the root, and its fibres: they are of the thickness of a straw, of a dark colour externally, and of a dirty yellowish white internally: taste, bitter and acrid, benumbing the mouth: odour, faint but disagreeable.

Composition.—Volatile oil, resin, wax, bitter principle, salts of potass, and ammonia. The virtues of the root may be extracted by water, but in a much higher degree by alcohol.

Medical Use.—Internally, cathartic; emenagogue; and is given in mania, epilepsey, dropsy, &c. *Dose*—from 10 to 20 grains of the root in powder acts as a violent cathartic; from 2 to 3 grains per day as an emenagogue and diuretic.

For symptoms, remedies, &c. see veratrum albi.

HYOSCIAMI FOLIA ET SEMINA. HENBANE.

Class,	Pentandria.
Order,	Monogynia.
Plant,	Biennial.

Character and Composition.—The medicinal qualities of this plant exist in the leaves, and seeds, and slightly in the root: taste, insipid and glutinous: odour, the leaves and seeds, when fresh, have a strong fœtid smell, which is lost in drying.

Composition.—Resin, mucilage, extractive matter, gallic acid, some salts, and an alkaline principle called hyoscyami, in which the several properties of the plant chiefly reside. Its narcotic properties may be extracted by water, but alcohol is its best solvent.

Medical Use.—Internally, narcotic, and antispasmodic. *Dose*—From 3 to 10 grains of the powder; from 5 to 20 grains of the extract. *Externally*, it is applied to cancerous ulcers and glandular swellings, in a cataplasm of the leaves, or the leaves powdered and sprinkled on the sore.

Symptoms, Remedies, &c.—Vide veratrum albi.

CONII FOLIA ET SEMINA. HEMLOCK LEAVES AND SEEDS.

Class,	Pentandria.
Order,	Dygynia.
Plant,	Annual.

Character and Composition.—The medicinal properties of the plant are contained in the leaves, which are of a dull green colour: taste, a nauseous bitter: odour, heavy and fœtid.

Composition.—Gum resin, mucilage, a bitter principle, and a resinous element in which the virtues of the plant consist, called conium, $\frac{1}{2}$ grain of which will produce vertigo. *Solubility.*—Water is a bad solvent, but alcohol and ether readily extract its virtues.

Medical Use.—Internally, narcotic; sedative; antispasmodic. *Dose*—3 grains of the leaves in powder may be given, and gradually increased. *Externally*, in fomentation, 1 ounce of the leaves to 2 pints of water; also in cataplasms to irritable ulcers, 2 drachms for a cataplasm.

Remedies, &c.—Vide veratrum albi.

COLCHICI RADIX ET SEMINA. COLCHICUM AUTUMNALE. MEADOW SAFFRON.

Class,	Hexandria.
Order,	Tryginia.
Plant,	Perennial.

Character and Composition.—It is a bulbous plant, bearing a rich purple flower: the properties of the plant are chiefly

contained in the bulb, but are also in the seeds: taste, bitter, hot, and acrid: odour, none.

Composition.—Gum, fecula, extractive matter, and an alkaline principle, the same as discovered in hellebore; vinegar and wine are its best solvents.

Medical Use.—*Internally*, diuretic; sedative; narcotic; cathartic. *Dose*—from $\frac{1}{2}$ to $1\frac{1}{2}$ drachms may be given of either the wine or vinegar of colchicum; and from 1 to 5 grains of the powder of the recent bulb in a pill.

Remedies, &c.—Vide veratrum albi.

AGARICS. FUNGI. MUSHROOMS.

Class,	Cryptogamia.
Order,	Fungi.

The varieties of poisonous agarics are, the agaricus muscarius, agaricus piperatus, agaricus bulbosus, and the Medusa's head, raven's-eye, and a number of others. The general and characteristic marks of the poisonous fungi are, that they are found in damp and shady places, and have a dirty, yellowish white appearance on the upper surface; and the gills, or the under surface of the plant, which are disposed in perpendicular laminæ, and so named from their resemblance to the gills of a fish, are soft and moist. The healthy varieties of the mushroom may in general be recognized by their firmness, growth in open situations, their upper surface being of a clean white colour, and their gills red, fresh and firm.

Composition.—The composition of these plants seems to indicate a nearer approach to animal matter than any other vegetable; they contain, in addition to hydrogen, oxygen and carbon, (the usual compounds of vegetable matter,) a considerable portion of nitrogen, and yield ammonia by distillation.

Medical Use.—None.

Symptoms.—Primary—Nausea ; vomiting ; severe pain in the bowels ; catharsis ; vertigo ; delirium ; excessive thirst. *Secondary*—All the above symptoms increased, with cramps of the extremities ; livid and ghastly countenance ; anxious tremblings ; convulsions ; coldness of the extremities ; death.

Remedies.—The stomach must be speedily evacuated by the application of the most powerful emetics, as sulph. zinci, from 20 to 30 grains—this is the most prompt evacuent—or tart. antim. 3 grains, or ipecac. 20 to 30 grains ; after the stomach has been freely evacuated, stimulants, as warm brandy and water, sulphuric or nitric ether, camphor mixture, spiritus minereri, or strongly acidulated draughts ; if inflammation supervene, the lancet may be carefully used, as also the tepid bath, emollient injections, &c. *Rationale*—The objects we have in view must be sufficiently obvious, from an examination of the remedies prescribed, viz. to evacuate the poison, destroy its narcotic effects, stimulate and support the system, and subdue the inflammation.

Morbid Appearances.—The stomach and intestines are sometimes found in a gangrenous state ; but where the poison has not been sufficiently virulent to produce gangrene, they are found in a state of severe inflammation. The membranes of the brain are generally in a state of great vascularity, and its vessels frequently more or less turgid with blood ; the lungs are sometimes found in a state of engorgement and sometimes not perceptibly affected.

Cause of Death—The manner in which these poisons produce death is various ; sometimes by their local action on the stomach and intestines, producing excessive inflammation and gangrene, and sometimes by the absorption of the poison into the circulation, and subsequent determination to the brain and lungs, producing death by their engorgement.

Tests.—There are no tests for these poisons but their botanical character.

ANIMAL.

PISCES.	FISHES.
Conger eel,	Conger muræna.
Grey snapper,	Coriacinus fuscus.
Yellow-billed sprat,	Clupea thryssæ.
Smooth bottle fish,	Ostricon glabellum.
Rock fish,	Perca marina, &c.

INSECTS.	
Worms,	Vermes.
Muscle,	Mytilus edulis.
Common lobster,	Cancer grammarius.
Common crab,	Cancer mænas.

These are the more common varieties of poisonous fish, but there are a number of others, which may be classed with the above, their effects &c., being the same or nearly so. The exact nature of their poisonous qualities is but little known: whether they reside in some part of the fish, are introduced in the form of food, constantly retained, occasioned by the spawning season, peculiar habits, or arise from sickness of the fish; or whether they depend upon some peculiarity of the person eating them, are all subjects of uncertainty and observation. Chemistry lends no assistance to detect the poison, and out of a number of individuals who may have partaken of the same fish at the same time, some are violently affected, others slightly, others not at all; from which we may safely conclude, that their poisonous effects are increased by the peculiar state of the system or digestive organs.

Cleaning and salting are the best preservatives, and will no doubt considerably abate, if not entirely destroy the danger. The crab and lobster are frequently in an unhealthful state when sold in the markets, arising from the barbarism of persons having them for sale, who insert a wooden plug into their claws, which produces mortification of the claw, and consequently an injurious effect upom the persons who may have eaten them.

Symptoms.—Primary—Nausea; constriction of the throat; thirst; suffocation; a burning heat over the surface of the body. *Secondary*—Diarrhœa; cold sweats; faintings; spasms; efflorescence of the skin; sometimes a miliary eruption; in the worst cases the eyes become inflamed; the joints of the wrists, ankles, and knees sometimes swell, with severe pain; stranguary; convulsions; death.

Remedies.—Immediate and powerful emetics, as recommended in poisoning by fungi; cathartics must also be given, the saline will be the best; emollient injections; copious draughts of mucilaginous fluids; after the stomach and intestinal canal have been freely evacuated, if the system appears to be much debilitated, give stimulants; if inflammation, general or local, make its appearance, the usual antiphlogistic remedies must be applied, but success in the results of our efforts in this, as every other case of poisoning, depends chiefly upon promptitude and decision. *Rationale*—Obvious.

Morbid Appearances.—The stomach and intestines are in a high state of inflammation; some patches of ulceration of the mucous membranes sometimes appear; there is generally a quantity of dark fœtid fluid found in the stomach; the vessels and membranes of the brain present appearances sometimes of intense, but generally of slightly increased vascularity.

Cause of Death.—Death appears to be produced by an absorption of the poison into the circulation, and its subsequent effects upon the brain, as well as by its local effects upon the stomach and intestines.

CANTHARIDES. SPANISH OR BLISTERING FLY.

Character and Composition.—These insects have a long, green and gold, shining body, with flexible green striped elytra, which cover the whole back of the body, and under which are their brown membraneous wings: on their head they have two black articulated feelers: the analysis of cantharides is still imperfect: taste, extremely acrid and burning: odour, peculiarly nauseous.

Medical Use.—*Internally,* stimulant; diuretic; antispasmodic. *Dose*—from 5 to 20 drops of the tincture twice a day. *Externally,* it may be managed so as to become a gentle stimulant, a rubefacient, or a blister. *Dose*—as a stimulant, from 20 to 30 drops, in an ounce of alcohol; as a rubefacient, double or treble the above; combined with resin, wax, and mutton suet, and made into a plaster, it is used as a vesicatory.

Symptoms.—*Primary*—Nauseous odour of the breath; acrid taste in the mouth; burning heat in the throat, stomach, and abdomen. *Secondary*—all the above symptoms increased; to which are added frequent vomitings, often bloody; copious bloody stools; excruciating pain in the stomach; painful and obstinate priapism, with heat in the bladder; stranguary or retention of urine, what does pass is generally bloody; frightful convulsions; delirium; death.

Remedies.—Vomiting should be excited by drinking freely of sweet oil, sugar and water, milk, linseed tea, or any other bland and greasy fluid—(the irritation, swelling and heat of the throat, will prevent the successful use of the stomach

pump, an attempt to use which would only increase these symytoms ; hence it will be better to adhere to the above treatment) ; emollient glysters should be administered, and if symptoms of general or local inflammation supervene, they must be met with the usual antiphlogistic treatment. The rationale of the above treatment is obvious.

Morbid Appearances.—The internal coats of the æsophagus, stomach, intestines and bl dder, in a state of excessive inflammation and corrosion ; some parts gangrenous ; the inflammation also extends to the kidneys, peritoneum and other parts of the abdominal viscera.

Cause of Death —The excessive and rapid degree of inflammation thoughout the intestinal canal, producing gangrene.

Tests.—The symptoms and morbid appearances are the best tests. If the poison has been taken in powder, the ulceration and gangrene will be in patches, whilst if taken in the liquid or tincture, it will be more general ; if taken in powder, by washing and filtering the contents of the stomach, some of the powder may be possibly discovered, which is easily recognizable.

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